大正七年七月十日第三種郵便物認可

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

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ELECTRIC LOCOMOTIVES IN JAPAN
FUSHUN OIL SHALE PROJECT
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Vol. XX April, 1924 No. 4

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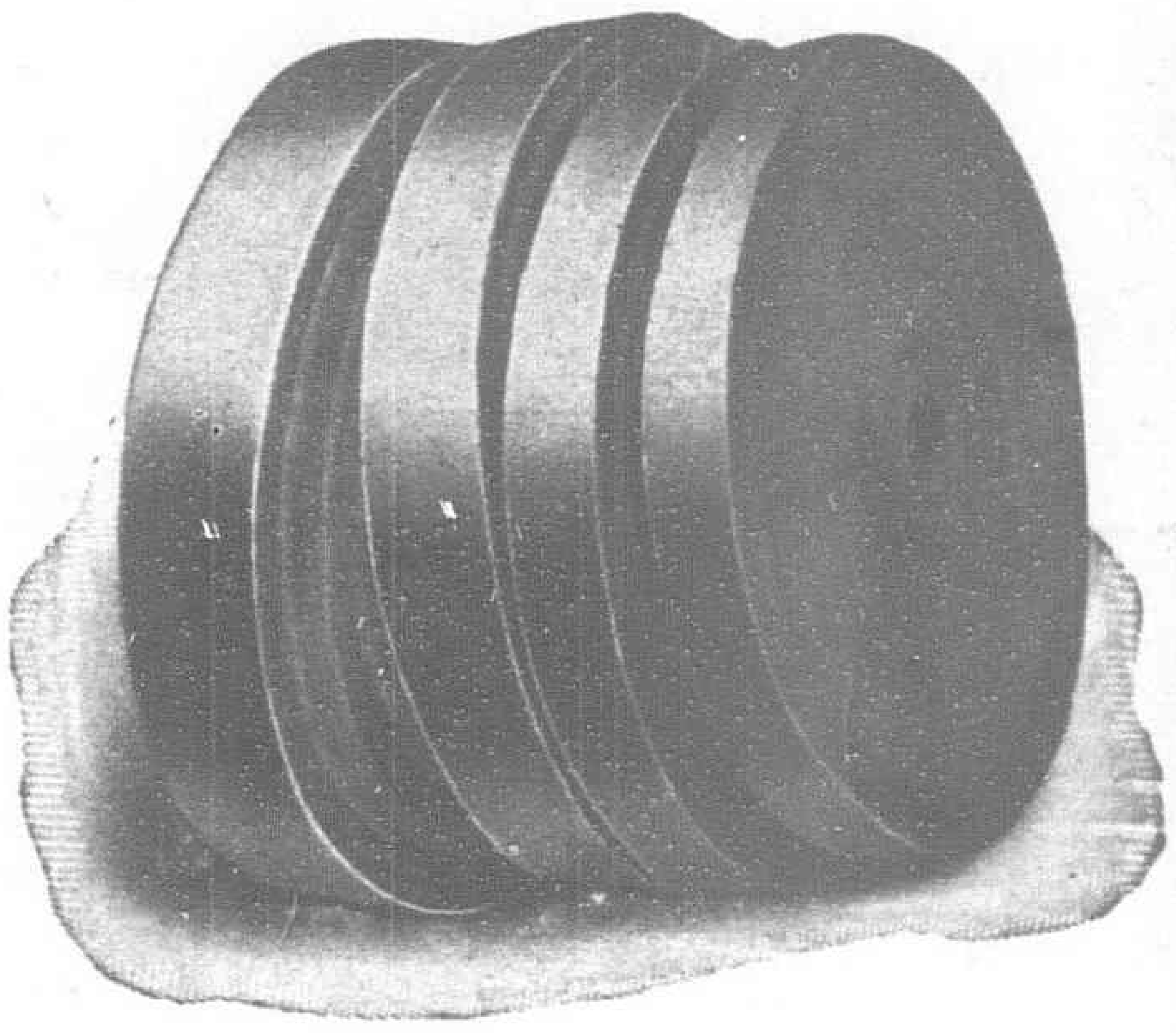

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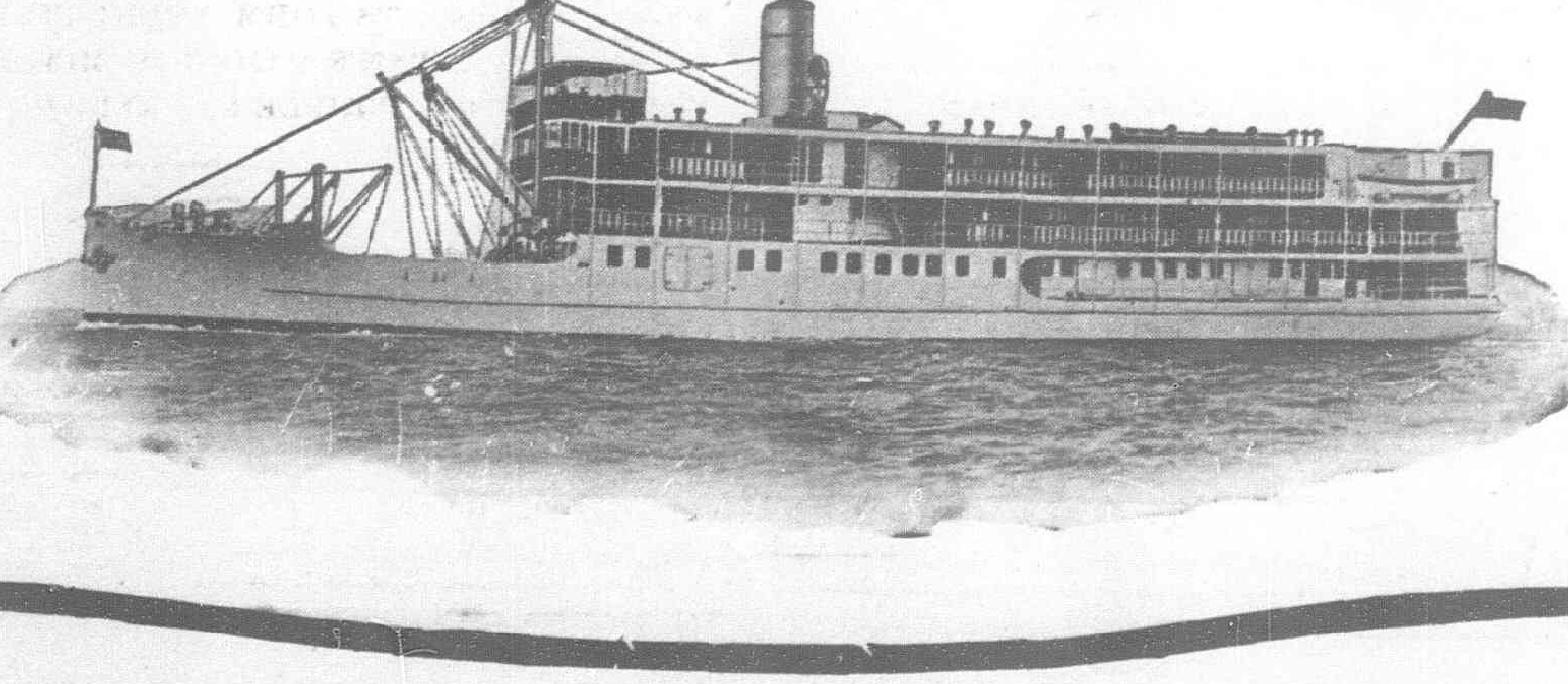

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, APRIL, 1924 No. 4

Japan Asks for a Square Deal

Picture No. 1: The Johnson Immigration Act

Japanese May Not Enter the United States—A Gratuitous Affront

By Geo. Bronson Rea

ALL efforts to eliminate from the Johnson immigration bill the discriminatory clause barring Japanese subjects from entering the United States has been met by uncompromising opposition from the Pacific coast congressmen and senators who seem determined to wantonly insult Japan against the advice of not only the highest officials of the administration but contrary to the interests of the manufacturers and toilers of the eastern states. Editors of responsible newspapers are asking: Why? There must be some good reason to explain why a quota basis which would limit their entrance to 246 immigrants a year is opposed by the Pacific coast legislators. This is a ridiculously small number, yet it would save the face of Japan and satisfy the honor of a proud and sensitive people.

In asking the question, *The Philadelphia Ledger* remarks:

> "We protest our friendship for Japan. On their island they are a splendid, a wonderful people. Our hearts go out to them, and so do our salesmen. While the broad Pacific rolls between us we are eager to receive—by cable—*their orders for American goods, and their remittance—in gold or trade.* But we do not want them as citizens; we do not even want them as immigrants debarred from the right of citizenship. We say to them, with Shylock, "I will buy with you, sell with you, talk with you, walk with you, and so following; but I will not eat with you, drink with you, nor pray with you."
>
> Why? Secretary Hughes asks the question of the house immigration committee, which is ready to exclude the Japanese immigrant in a manner so marked and offensive that, as he says, it likely "would largely undo the work of the Washington conference on limitation of armaments, which so greatly improved our relation with Japan."
>
> "Why? It is a fair question."

> The *Boston Post* says: "It is an old combination of circumstances that at the very moment when the new Japanese 'earthquake' loan of $150,000,000 is going very well indeed here in the United States, and especially out in California, where they regard the man from Nippon as a good deal of a menace, congress should be considering a section of the restriction of immigration measure that would exclude Japanese from this country entirely.
>
> "Secretary Hughes departs from his usual custom, and flatfootedly says that the measure ought not to pass. In a letter to Chairman Johnson of the house immigration committee, he declares: 'I am unable to perceive that the exclusion provision is necessary, and I must strongly urge upon you the advisability in the interests of our international relations, of eliminating it.'
>
> "Such a ban would be totally inconsistent with our treaty obligations to Japan, and would endanger the success of the reduction of armament agreements, which the Japanese signed with the utmost good will. Why at this period of history deliberately affront a friendly power. Mr. Hughes is right."

The *Jacksonville Times-Union* asks the question in these words:

> "What is the use of telling Japan that we do not mean to be discourteous when the proof is so plain that that is just what we do mean. On the part of the American government and of the American people in general there is no ill will towards Japan but there is intense ill will on the Pacific coast and the men who cherish this ill will have votes.
>
> "*A few days ago Secretary Hughes suggested that Japanese be admitted* to this country on a basis of the Japanese population of the United States in 1890. This would admit fewer than 250 Japanese a year and would not be an insulting discrimination against Japan. Why could not this be done if we do not mean to be discourteous?
>
> "Why are we so willing to insult Japan? The Japanese are not more objectionable than the people from Eastern and Southeastern Europe and Japan's good will is of vastly more importance to us than the good will of the nations of that part of the world, or for that matter, the good will of the nations of any part of the world. Japan is right beside the weakest spot in America's defense and yet to please a part of the people of a small section of the country we insult her when we could accomplish our purpose just as effectually without giving cause for offense."

That the affront is gratuitous is emphasized when it is understood that the Japanese government does not desire to force its people upon the United States. With Japan it is essentially the recognition of an elementary principle of international intercourse. As explained by Ambassador Hanihara at the last annual dinner of the Japan Society held in New York on March 10: "it is the question of whether the Japanese as a nation, and not as individuals, are entitled to that respect and consideration by other powers, which they, by common consent, accord to each other, and which form the basis of amicable intercourse among the nations of the civilized world.

> "With Japan," he said "it is not the question of immigration or emigration as it appears to be commonly understood. As far as Japan is concerned there is no question of her sending more emigrants to this country. Not only did we declare our intention at the time of the conclusion of the present commercial treaty of 1911 between your country and mine, to exercise voluntarily *control over the coming to this country of our emigrants who are not* desired here, but we have been most scrupulously and effectively carrying it out in deed. The facts in possession of your government will prove it, in spite of the persistent allegations to the contrary. If you choose to restrict your immigration it is your own affair. Another country has no right to complain about it so long as such restriction is imposed in a manner conforming to the terms of treaties and involves no arbitrary or unfair discrimination against other nations.
>
> "With Japan the question, is not one of expediency—of whether Japan be allowed to send a few hundreds more of her emigrants to this country or not—but one of principle: of whether her self respect as a nation should be given proper and friendly consideration or not."

Supplementing the above clear-cut declaration of his ambassador, Premier Kiyoura expressed the confidence of his government that "America's sense of justice and consideration for the sensibilities of others" would determine her ultimate action. In view of the reasonableness of Japan's modest request for courteous treatment, and the renewed agitation on the part of California interests to affront her wantonly, the rest of the country is entitled to ask, WHY!

Picture No. 2: The Jones Act

Driving Japanese Shipping from the Pacific

THE United States shipping board and the interstate commerce commission have decided to enforce Article 28 of the U. S. shipping act after May 20. If this law is applied no cargo will be obtainable by Japanese ships on the trans-Pacific services after that date. The Pacific freight conference will crumble and business will be practically monopolized by American steamships. Article 28 prohibits American railways from charging special low rates for passengers and freight transported by foreign steamship companies on a through traffic arrangement. It has never been enforced because of protests from foreign governments, the railways and Pacific coast chambers of commerce.

The operation of Article 28 will nullify the agreements between the trans-continental railways and foreign steamship lines and make it impossible for the latter to further enjoy advantages under which they have hitherto been operating. The difference between the two rates are shown in the following table :—

EXPORTS FROM JAPAN

	Railway charges	Freight rates of Pacific Conf.
	(Unit dollar)	
Tea (*a*)	1.50	.40
,, (*b*)	4.80	—
Porcelain (*a*)	1.50	.50
,, (*b*)	3.88	—
Matting (*a*)	1.50	.40
,, (*b*)	3.98	—

EXPORTS FROM THE UNITED STATES

	Railway charges	Freight rates of Pacific Conf.
Metal manufactures (*a*)	.72	.25
,, ,, (*b*)	1.30-2.70	—
Machinery (*a*)	1.15	.40
,, (*b*)	2.50	—
Automobiles (*a*)	3.65	.40
,, (*b*)	4.95	—
Raw cotton (*a*)	1.17	.45
,, ,, (*b*)	1.66	—

(A) indicates the rate on goods carried by American ships, and (*b*) by foreign steamers.

The rate on raw silk is 9 dollars per 100 *kin* at present but the rates to be applied after May 20 are unascertainable.

If Article 28 is enforced after May 20, the joint traffic arrangement between the Nippon Yusen Kaisha, the Osaka Shosen Kaisha and the Northern Pacific trans-continental lines terminating at Seattle, will be nullified and these two Japanese steamship companies driven out of the American trade. The O.S.K. which has done more to put the port of Seattle on the map than any other factor will be hard hit. Last year it declared a seven per cent. dividend, while the Toyo Kisen Kaisha operating out of San Francisco showed a loss of Y. 2,510,000 for the year. The plan for amalgamating the T.K.K. with the N.Y.K. having fallen through, the former company will be able to carry on only by drastic retrenchment in all lines of its activities.

The other side of the picture shows the Dollar Steamship line of California acquiring from the U. S. shipping board seven of the famous " President " liners at a cost of $3,850,000 and given until March 15, 1936, or thirteen years, to pay it in—one of the most liberal subsidies ever granted by any government to a steamship line. These ships cost nearly $30,000,000.

The Admiral-Oriental line operating out of Seattle despite Japanese competition, did a remarkable business in 1923, dispatching 71 full cargoes to the Orient. They have a fleet of five passenger liners and 12 cargo vessels with a total of 146,411 gross registered tons or 168,354 deadweight tons. During the year it handled 758,818 revenue tons of cargo. The Dollar, Pacific Mail and the Admiral-Oriental lines got their fair share of the westbound trans-pacific business but were not so fortunate in the homeward cargoes. In fact, as Mr. A. F. Haines, general manager of the Admiral-Oriental Company, pointed out in an address before the officers of his line, " the company's greatest difficulty is the lack of homeward cargo. Vessels," he said, "are obliged to return in ballast. The entire round trip expense must be borne by the outward freights."

Here is food for thought. The proposed rates as outlined above on principal commodities will give the American ships the preference coming and going, enabling them to dominate the Pacific trade.

In other words, the Japanese ships will be driven from the Pacific. In the face of this serious menace, do we hear the Japanese people hurling insults at America ? Not at all. In the same way they have approached the immigration bill now before congress, they appeal to American sense of justice and fair-play. The O.S.K. will be harder hit than any other Japanese shipping company, yet its vice-president Mr. Shozo Murata, tells his people to be patient and appeal to the intellect rather than the emotions of the American people; to call attention to the problem in a quiet and unostentatious manner.

> " I believe" he added, "that immediate enforcement of the shipping law under discussion is a play on the part of Washington politicians for the support of capitalists and industrialists preparation for the general election to be held in the United States in November. " Such a discriminatory law will, I am sure, encounter strong opposition from fair-minded statesmen and business men in America who have the sound development of trans-Pacific trade at heart."

Mr. Murata stated that he had been informed from reliable sources that strong opposition to the enforcement of the preferential shipping law would be registered by the combined chambers of commerce of the Pacific coast, by Pacific coast ports, by the American railways which have been doing business with Japanese steamship lines for many years in the past, and also by statesmen who, although living in the East, do not see any immediate gains in political prestige to be obtained among their constituents, and will oppose the proposal from an impartial standpoint. He advised strongly against starting any vigorous agitation that might be calculated to accomplish more harm than good.

* * *

Japan's Only Outlet

Picture No. 3: Diverting the Racial Issue to Central Asia

JAPANESE cannot enter the United States on an equal footing with the white races of Europe. They are barred from Canada, New Zealand, Australia and British South Africa. If they emigrate in large numbers to some South American country, exclusion laws will be enacted to keep them out. The population of Japan is increasing at the rate of 700,000 a year. In twenty-five years at the present rate of increase, there will be 100,000,000 Japanese subjects. Where are they to go ?

Formosa is no outlet. The Hokkaido may absorb a few million. The Philippines as an independent state would be compelled to open its doors to Asiatic emigration. A few million Japanese might find homes under the Katipunan flag. There is no room for them in Java. It will not be long before the Dutch will have to encourage emigration from this overcrowded island to people their other East Indian possessions. The swarming lands of the Hindoo and the Chinese offer no solution to Japan's problem. What is the remedy ? Birth control ? Unsexing the males ? They would object to that. The laws of nature will prevail and the Japanese will increase. While we are discussing the problem millions of new Japanese are entering the world, preparing for the struggle for existence. Where will they go ? Argue as we will, talk about it until we are blue in the face, the world cannot escape the cold hard facts of an actuality.

The Japanese must either have an outlet or remain at home. If the latter, they must live. The nation will become a hive of industry, buying its raw materials from all parts of the world and selling its manufactured products in exchange for food. In the keen struggle for existence they will undersell other competitors in the markets of the world and if we place obstacles in the path of their shipping we strike at their right to exist. Japan will become a second England, her very lifeblood extracted from the ocean, from her shipping and foreign trade.

The Japanese cannot colonize China. They cannot own land outside the treaty ports until extraterritoriality is abolished. It is well for other foreigners to keep this fact always in mind. The exclusion laws of the West are forcing the Japanese into a corner, where their only hope of racial survival lies in having an outlet on the mainland and here for the present they are barred from owning and working the land by the application of extra-territorial principles. The day must come when the immigration policy of the West will compel Japan in self-defense to join her demand to that of China for the abolition of treaties which operate as the last barrier to her right to exist. That day cannot long be deferred, and with these barriers removed the surplus millions of Japan will find a home under the rainbow flag of the flowery republic. Here, there are no racial antipathies. The Chinese and Japanese will intermarry, they will assimilate. The Chinese may perhaps absorb the Japanese, but in the last analysis blood will tell. Japan and China will come together and unite in a solid front against those peoples whose laws confine them to Eastern Asia.

As Japan's millions are mounting so the Chinese are multiplying, how rapidly, no one can tell. Such statistics as are available indicate that the Chinese are doubling their numbers in 33 years. Is it too much ? Let us say they are doubling their numbers in fifty years. In the next quarter century, within our lifetime, there will be another 200,000,000 Chinese. But this is the Yellow Peril our readers will say. Granted. Cut it in half and say the Chinese are less prolific than the white-man. Let us take a dose of hop and dream that he is doubling his numbers in 100 years. In the next twenty-five years there will be 100,000,000 more Chinese. Add to this the 30,000,000 subjects of the Mikado. Where will these 130,000,000 people find homes ? There is only one place in the world for them. In Manchuria, in Mongolia, in the waste places of China, Sinkiang and Central Asia.

If we block their legitimate expansion in this direction the laws of nature cannot be set aside. The flow will be diverted over the seas, across the Pacific, to somewhere in the Americas. Keep this picture in mind and then glance at the other presented by Russia. Here we find a population of 190,000,000 doubling their numbers in fifty years. In twenty-five years there will be 100,000,000 more Russians. Behind the Slav stands the Teuton with a population of 60,000,000 increasing at the same rate. In the same length of time there will be 30,000,000 more Germans whose emigration into the lands of their late enemies will be prohibited. The Teuton must find his outlet in Russia, in Siberia. In fact, that is the program of the German government. Here they will find 100,000,000 Slavs with their faces also turned towards Central Asia. On one side of the picture we seen at the most conservative estimate, 130,000,000 Mongols spreading over the lands of Manchuria, Mongolia, Sinkiang and pressing onwards into Central Asia. On the other side we see the Slavonic hordes pushed forward by the Teutons working eastwards towards the same goal. The racial question if not diverted by amateur diplomats will be settled in due time where it belongs; on the plains of Central Asia and between the peoples most concerned.

If Slav diplomacy, backed by the full weight of Central Europe, succeeds in diverting the Mongol tide from its natural channel, the racial issue will be again shifted to the Pacific for America to face and solve. We have more than once expressed our views on this problem. We see no good reason why American enterprise or American diplomacy should stand in the way of Japan's legitimate expansion in Manchuria, as any interference that will strengthen the diplomacy of Russia and divert the racial movement from its natural channels can only result in forcing it over the Pacific. Our stand on this question is eminently American. We see no reason why the boys of the United States should be called upon to fight Japan in the Pacific in order to consolidate Russia's hold on vast territories in Central Asia stolen from the Yellow Man and now needed for his expansion.

If Japan is to live she must seek her outlet in Asia, in Manchuria, in Mongolia. After closing the doors of America to her people and driving her shipping from the Pacific, it is the height of injustice to follow her up, in Asia and stand between her and her right to live. Are we doing this ? Let us look at another picture.

* * *

Japan's Struggle to Exist

Picture 4 : Driven into a Corner

HAS America stood in the way of Japan's legitimate right to exist ? Let us examine briefly the high points of history.

Japan fought China in 1895. The giant of Asia was defeated and forced to sign a humiliating peace, ceding to the victor amongst other possessions, the Liaotung peninsula. Fearful of the spread of Japan's influence on the mainland, Russia induced France and Germany to support her and demanded from Japan the return of Liaotung. Before this coalition of the three strongest military powers of Europe, Japan complied, accepting instead a cash indemnity. A grateful China then sent its most powerful viceroy to St. Petersburg and there entered into a secret treaty of alliance with her northern neighbor. To enable Russia to get into a better position to crush Japan, China ceded the rights to the Chinese Eastern Railway, surrendered her sovereignty over the railway zone and later on in 1898, leased the Liaotung peninsula to Russia as a naval base, the very territory Japan had been compelled to relinquish.

While these events were happening, John Hay, the American secretary of state, promulgated the "open door" doctrine which carried with it recognition of China's sovereignty over her then existing territories, America stood before the world as China's disinterested champion, after she had secretly ceded her lands to Russia in order that the latter could wage a war of revenge upon Japan. Under the Hay doctrine, Japan could take no adequate steps to defend herself against this secret coalition. She allied herself with England and fought the war of 1904. Japan saved her independence at a cost of 200,000 men and national bankruptcy and owing to the profound secrecy surrounding the Sino-Russian treaty of alliance was swindled out of a cash indemnity at Portsmouth. Japan paid the price for China's perfidy, the heaviest sacrifice any nation had been called upon to pay up to that date. Had the existence of the Li-Lobanoff treaty revealed in 1922 at Washington been even suspected at Portsmouth, China would have had to pay in territory for her participation in bringing about the war. The Liaotung Peninsula and the whole of South Manchuria would have passed under Japan's sway. Oriental secret diplomacy precipitated one of the most disastrous wars of history and ranged the world on the side of China. She emerged from the conflict as the injured and innocent victim and at once commenced intrigueing to deprive Japan of the modest fruits of her victory.

In this she was aided, abetted, advised, supported and encouraged at all times by Americans, deluded into the belief that Japan was the aggressor. The ink had hardly dried on the Portsmouth treaty when E. H. Harriman, the most powerful railway manipulator of his day, initiated negotiations to acquire the South Manchuria line from Japan in order to realize his dreams of a round-the-world railway service. When this scheme fell through, the wheels of American diplomacy and finance were set in motion in order to create a situation which would compel Japan to sell out. Maintained in complete ignorance of the secret relations between China and Russia, the American government stood firmly behind Harriman with the American consul at Mukden as his personal instrument. The agreement for a huge American loan for Manchurian development was signed in order to forstall Japan in the exploitation of the province and later the concession for the Chinchow-Aigun Railway was obtained and employed as a lever to compel Japan to accede to the demands of Harriman and sell the South Manchuria line.

Russia was making prodigeous efforts to resume the conflict. The Amur Railway was built, the Siberian line double-tracked, the lands east of Baikal colonized and industries established so her armies would be independent of European Russia for their supplies in the next war. Count Witte tells us that the conflict was to be resumed in 1912. Yet into the very centre of this maelstrom of hate and strife came the Americans with their high ideals of equal opportunity, the open door, railway rights, financing privileges and other facilities for extending their trade and influence. It was all very commendable, very legitimate.

Russia annexed Mongolia in 1912, the final step towards the consummation of her well-laid plans to be revenged upon Japan, and at once started negotiations in Paris for the loans necessary to build strategic railways through this region and enable her armies to outflank Japan's position in South Manchuria. In self-defense Japan extracted from China the right to construct the Taonan-Jehol Railway, a purely strategic road that would act as her outer line of defense against the menace from the direction of Urga. This line conflicted with the American rights to the Chinchow-Aigun Railway and Americans could only see in Japan's manœuver a deliberate attempt to oust them from that region. At no time were Americans able to visualize the intense play that was going on before their eyes or realize that Japan was keeping step with every move made by Russia to resume the drawn battle postponed at Portsmouth.

Japan was fighting for her life. Americans were interested solely in an abstract principle. China and Russia were working together to encompass Japan's downfall and humiliate England. To this end Russia used her French ally and Belgian agent and by 1914 had cut China north to south and east to west with concessions for strategic railways. The Trans-Asian trunk line had its deep-water outlet at the mouth of the Yangtze opposite Woosung, with the Russian bear twiddling his fingers before his nose at the British lion on the opposite shore. All these Russo-Franco-Belgo lines were designed primarily for the Russia conquest of China and the invasion of India from the north-east. And again, with Japan facing extinction and Britain the loss of her most valued imperial possession, Americans could only visualize a violation of the "open door" principle, an interference with their right to equal trade opportunity. Not one American writer, statesman or diplomat had the faintest idea of what it was all about; if they did, they kept their own counsel.

Came the great war, and the twenty-one demands of Japan. In the light of China's railway intrigues and Russia's triumph in outwitting the Anglo-Japanese combination, it is easy enough at this time to justify these demands, especially if we hark back to pre-war diplomacy and employ the same logic and reasoning advanced by European governments of that day to vindicate their forward policies. China had surrendered her vital transportation possibilities to Russia and her allies. Russia was preparing to precipitate another war in order to accomplish what she failed to do in 1905. On the surface it looked as though Japan had taken an unfair advantage of China, but the whole picture will disclose that she acted along the same lines and for the identical reasons that the British penalized China in 1898 through a similar ultimatum. Whether she was justified or not will remain a matter for discussion. Historians of the future will determine the truth.

In the meantime, Japan strengthened herself in China by loans and other moves. She financed the Peking party in order that both countries might present a solid front against the encroachments of the Soviet. The other powers became alarmed. America invited France and England to join in the formation of a new international financial consortium for placing China on her feet. Underneath all the high flown phrases of diplomacy connected with the creation of this instrument, the great truth stands out that it was more concerned in circumscribing Japan's activities than in regenerating China. Japan's position on the Taonan-Jehol line was made a special object of attack. She was denied the right to defend herself against the menace from the direction of Urga, a right that all her allies had laid down in the Versailles treaty when their own safety was at stake. In this respect, the consortium perpetuated the mistaken American policy in Manchuria which at all times hampered Japan's right to protect herself against the preparations of Russia to renew the conflict.

It is needless to recapitulate the history of allied intervention, of Siberia or how America once more was placed squarely across the path of Japan in a quarrel that we had no direct interest in. Suffice to say that Japan eventually withdrew her troops and surrendered her advantages in order to conform to American opinion. Not only in Siberia, in Northern Manchuria, but in Central China and in Shantung did Japan recede, and after all this, the Chinese raised the question of the legality of the 1915 treaties and tried to oust her from the Liaotung Peninsula. Under the steady pressure of American diplomacy and public opinion Japan is once more back to where she was in 1914, with the possibility at any time of the Chinese Eastern Railway falling under control of the Soviet, bringing the soldiers of the red army to Changchun, grinning at the discomfited Japanese across the station platform. Japan has been divested of every advantage obtained as the result of tremendous sacrifices and of every gain she had the right to expect from her allies for her share in the great war. She is back to where she started in 1905 facing an uncertain future in Manchuria where not only her national existence but her economic future is at stake.

What is the situation in Manchuria to-day? Last year when the Japanese Oriental Development Company negotiated a $10,000,000 loan in New York, the American chamber of commerce at Harbin composed largely of American firms staffed with Russians, came out with a violent protest for fear the loan would be employed to injure American trade interests in that region. This, at a time when the Soviet had driven Americans out of Mongolia. There was no protest against the Russian move. When later, the South Manchuria Railway tried to negotiate a similar loan in New York the same protests were heard. This time they were more successful. The loan failed and Japan went to London and obtained the money from the British. Funny people, the British. When Japan first took over the South Manchuria Railway her British allies loaned the millions to rebuild and equip the line. The Japanese spent the money in America and did for Americans what they have never been able to do for themselves in China. They built and equipped an up-to-date American railway and in doing so provided the Chinese with an object lesson in American railroading that has brought from them many profitable orders for similar equipment for their own lines.

Now the S.M.R. has made Manchuria what it is to-day. Japanese money, Japanese brains, Japanese initiative and Japanese enterprise have transformed the most backward province of China into the most advanced and most prosperous. They have developed Dairen into the second port of China. What is most important to Americans is that since the South Manchuria Railway came into possession of Japan, over $75,000,000 gold has been expended in purchases of materials from the United States. America has never contributed one cent towards the development of Manchuria but has reaped the major trade benefits from the investments of others. European nations advanced over $150,000,000 gold to the Chinese government for railway construction in order to obtain orders for materials to the amount of $75,000,000. In other words, American manufacturers without advancing a cent have profited through the Japanese ownership of the S.M.R. to the same extent as though our bankers had financed all the loan built railways of China and from which they were excluded in the supply of materials! Yet in order to please a narrow-minded group of exporters and importers, Japan was refused a small loan for the further development of the S.M.R. which was advanced by the British. This after Americans had reaped all the fruits of previous British loans for the building and equipment of this line!

The South Manchuria Railway is not concerned with political expansion. It has a very definite place in Japan's scheme of defense, but its chief concern is to develop the resources of the country it serves. It is always doing things, big things. It sometimes makes mistakes. Other large enterprises do likewise. Look at its estimates of expenditures for the current year.

The budget for the new fiscal year is estimated at Y. 49,700,000, Y. 23,400,000 larger than the first revised estimates for the preceding year. Y. 12,000,000 for railway construction, etc., includes the building of a new station for Dairen, double-tracking of the main line north of Tiehling, and construction of locomotives and cars for carrying coal. The necessary alterations and installations for the Dairen wharves are included in Y. 3,500,000 for harbor improvement. The mining enterprise takes up Y. 3,300,000. For the Anzan Iron & Steel Works, Y. 8,000,000 is appropriated. It is part of the total outlay of Y. 11,084,400 for the extension work. Y. 3,200,000 is for improvement of electricity works; Y. 9,200,000 for the local administration, including education, hygiene, and public works; and Y. 5,000,000 for reserve fund. The estimated receipts are put at Y. 38,500,000 being an increase of Y. 12,000,000 for the preceding year. Among the fresh enterprises may be counted the increase of Fushun coal outputs from 4,900,000 tons to 5,500,000 tons, the increase of its exports to Japan from 500,000 tons to 1,000,000 tons; erection of new Yamato Hotel buildings at Mukden; construction of a new 3,600-ton steamer of the D.K.K. Shanghai line; and construction and expansion of a glass factory.

Here are $25,000,000 gold to be expended during the current year, for improvements and extensions, new plant and other activities that will provide a market for American manufacturers. The S.M.R. has found a way to work the low-grade iron ores of Anshan at a profit and will erect a 200,000-ton steel plant. They are now solving Japan's petroleum problem by extracting it from the oil-bearing shale of Fushun. Millions are to be expended to develop these new industries and most of the equipment will be purchased from American manufacturers. It means more business, more cargo for our ships, more trade for our merchants, more prosperity all around.

Let us look at another picture. In this number of THE FAR EASTERN REVIEW is found the report of Mr. Oustroumoff, manager of the Russian Chinese Eastern Railway. He tells us that the Chinese Eastern and the Ussuri Railway administrations have entered into a joint agreement to hand over their ocean freight business, to a well-known American shipping company. This is quite legitimate.

Further on in his report he mentions the plans of the railway management to concede special favors to all cargoes imported into Manchuria by the way of Vladivostok. This is not quite so legitimate, and if practiced by the Japanese S.M.R. line would be considered by some Americans in China as a cause for war. Now if we will recall the previous picture of how the application of Article 28 of the U. S. shipping act will affect the Japanese steamship interests, how American steamships will succeed to their business with the American trans-continental railways, and then turn our eyes towards the other side of the Pacific, we see an American steamship company having a similar arrangement with the two Russian railways terminating at Vladivostok, a combination that will give to Americans a monopoly of the trans-pacific carrying trade. Mr. Oustromoff's plan to grant special favors to cargo imported into China via Vladivostok will enable Americans, once the Japanese steamships are driven from the trade, to seriously menace the prosperity of the S.M.R. The special American railway freight rates enjoyed by goods imported and exported on American steamships added to similar special favors on the two railways serving Asiatic Russia and Northern Manchuria will enable whoever holds the through traffic agreement at both ends to monopolize the trade. This is not all. Add to these specially favorable conditions the specially favorable tariff imposed on goods imported or exported into China over the Russian border, or about one-third less than the tariff paid on similar imports and exports at Dairen, and we begin to have some idea of how Article 28 of the Jones act may strike at the most vital point in Japan's economic life.

In stating this case we do not wish to imply that the American steamship company referred to is seeking to take an unfair advantage of Japan through a deal which will give its cargoes preferential treatment over the rails of the Chinese Eastern Railway. The agreement between the Russian railways and the American steamship company, we understand, has not been signed. The fact, however, that Mr. Oustroumoff admits that it is a possibility is sufficient for our purpose. Neither are we criticizing the American company. It is entitled to every legitimate advantage it can obtain in the keen struggle for cargoes, and if the Russian lines elect to contract with an American steamship company to handle its through ocean freight on lines similar to the provisions of Article 28 of the Jones act, they are probably well within their right. They are not within their right, however, when in addition to the lower import and export tariffs imposed on goods crossing the Chinese-Russian frontier, they concede special railway tariffs or other favors to such cargoes that will seriously imperil the economic position of the South Manchuria Railway.

It may be accepted as an axiom that whatever American trade has been developed in Manchuria is traceable to the activities of the Japanese. The Russian-Chinese Eastern Railway up to a few years ago was employed solely to advance Russia's imperialistic designs in Eastern Asia and promote the trade and industries of Siberia. It is natural for the Russian line to seek every advantage over its Japanese rival, but there is no good reason why Americans should become a party to their schemes. If the Russian plans are carried out in conjunction with some American steamship company, it will operate unfairly to the injury of Japan.

All this throws into bold relief the long-drawn out intrigues on the part of Russia to cause bad blood between America and Japan. First, we had the Vanderlip concession in Siberia and Saghalien which violated Russia's treaties with Japan in regard to fishing and other rights. Then came the Sinclair oil concession in Saghalien-sops thrown out by the Soviet to influence American recognition and embroil us with Japan. This was especially true in the case of the Sinclair concession given at a time when northern Saghalien was occupied by a Japanese army as a pledge that Japan would be indemnified for the Nicolaievsk massacre. In fact, Americans at home were informed by a representative of the Sinclair interests that the United States would have to fight Japan over these matters. Curiously enough, this gentleman was also a sort of Chinese Pooh Bah, an adviser to the president and several *tuchuns*. It is a further strange coincidence that the representative of the Sinclair interests now in Moscow pushing the claims of his employers is also a highly paid foreign official of the Chinese government and adviser to the president. When we add to these open incitements to international discord the plan advanced by Mr. Oustroumoff that would use an American shipping company as the Russian instrument to deprive Japan of the legitimate fruits of her industry in Manchuria, we can better appreciate Japan's plea for a square deal from America.

If we are to close our doors to the Japanese, drive their shipping from the Pacific and then follow them up in Siberia and Manchuria and hamper their economic expansion in the one corner of the world where our policies have driven them, can we always expect them to view us as their friends ? Is there not some other place in China where American activities could be exerted in building up a trade sphere where their interests will predominate, without forcing ourselves into the corner where we have driven Japan to seek her future ? If Americans desire to exploit such a region where the profits will be greater than in Manchuria, we will point the way ?

* * *

Get Behind "Bill" Carey

Picture No. 5 : All Aboard for Szechuan !

An Outlet for American Capital and Energy in China

IN the far-west of China lies an empire inhabitated by 60,000,000 hard-working people, a rich, prosperous, self-contained land whose only outlet to the world lies through the dangerous rapids of the Yangtsze Gorges. Here, in Szechuan innumerable opportunities await the investor, the miner, the engineer, the manufacturer and the merchant. Minerals of all kinds abound. A system of irrigation carries the melted snows of Tibet to the Chengtu basin, one of the richest agricultural regions of Asia .From these same mountains will come the hydro-electric power that will industrialize and convert the province into a great manufacturing center. It is the only place in China where such water power possibilities exist.

This wonderful country has long been the goal of railway enterprise in China. The British, the French, the Germans, the Belgians, the Russians and even Americans have laid awake nights scheming to gain the right from the Chinese government to open up this treasure-house through the construction of railways. The story of these railway intrigues forms one of the most interesting chapters in China's modern history. It is too long to relate here. Sufficient to say that Americans have had several opportunities to build these lines and failed to take advantage of them. It will surprise many to learn that the only railway right possessed by Americans in China arises from a promise given by Prince Ching in 1903, to minister Conger that in the event foreign capital became necessary to build the line into Szechuan, Americans and British would be given the preference. Aside from the original Canton-Hankow concession this was the only right we acquired, and used it in order to break into the Hukwang negotiations and be admitted on an equal footing with France, Britain and Germany. As a consequence of this somewhat vague and shadowy promise, the American Group now holds a quarter share in the Hukwang loan with the right to build the Ichang-Wanhsien section of the line to Chengtu.

In 1913, the representative of Dr. Sun Yat-sen offered the American Group a concession to build the Canton-Chengtu railway with its branches, constituting the southwestern trunk system of Dr. Sun's scheme. No financial advances were required. They were simply asked to sign a preliminary agreement, establish American rights and hold them in cold storage. It was rejected. Then came the Siems-Carey Company and after being shooed off the preserves of other powers, finally obtained the contract to build a railway from the Peking-Hankow zone to Chengtu. They carried out the surveys and when ready to start work the British protested. These protests carry no weight at present.

There is nothing to prevent American capital and enterprise from carrying out this important project. It is true that the Siems-Carey contract is pooled in the international consortium, but there is nothing to obstruct Americans from financing it themselves, if their other partners decline to participate. Such a job is one American engineers pride themselves on. An American railway into Szechuan carrying the produce of an empire to its ships at Hankow and freighting back the necessities of 60,000,000 people is one of the few big railway dreams yet to be realized. From this main artery of communication, branch lines, tramways and roads will radiate to the farthest corners of the province and in a decade or so a vast industrial state will be evolved that will overshadow in importance all other provinces of China. Factories and mills will follow the railway, electric light and power plants will line the banks of the mountain rivers, mines will be opened and the minerals worked into finished products within the province. In this region American capital and enterprise can duplicate the work of Japan in Manchuria.

Here then lies the opportunity of America. "Westward the course of empire takes its way." Why "crab" everything that Japan has done or is trying to do in Manchuria. It is the only outlet she has for her energies. Co-operate with her in that region, or, if we want a sphere of our own to show what we can do, let us trek westwards towards the roof of the world and develop Szechuan. Here, Americans can put into practice and realize those dreams of Anglo-American co-operation in Asia about which we are now hearing so much. Szechuan borders on Tibet, that vast mysterious land rich in unexploited natural resources. The British have a treaty with China which prohibits the granting of Tibetan mining concessions to foreigners, but this was aimed solely at Russia. The British would be only too willing to carry out the American idea of co-operation and let down the bar for our capital and explorers.

Let us remember that outside of our $7,500,000 share in the Hukwang loan, Americans have contributed nothing towards the development of China's railways, or the trade these railways have made possible. American commerce with China has grown to its present proportions not because of any special effort on our part, but in spite of it.

If Americans would annually invest through loans to China the same amount to build the Szechuan railway and develop the resources of that province that the South Manchuria railway allocates for improvements and new enterprises, say $25,000,000, they would soon create a sphere that would bring trade returns far beyond their dreams.

True, the time is not propitious for lending millions to China or embarking on any ambitious development program. Not until a stable, unified gorvernment is functioning at Peking can the essential guarantees be forthcoming for such an undertaking. But this will come. In the meantime, Americans should pause and take stock of the situation, of their trade prospects and what the future holds out for them. They should devise their own plans for the development of China with American capital. It is good to have a definite program and fixed policy, even if it be only a commercial one. No real progress can be made by hanging on to the coat-tails of other nations waiting for them to advance the loans for railway and industrial undertakings and then invoking the open door doctrine and picking the agreements to pieces in order that our manufacturers may participate in the business created by others. This is not the true spirit of America. It is the way of the weakling and the parasite.

It is time Americans awoke from their trance and contributed towards the material development of a country from which they expect such wonderful trade returns. It is puerile to say that we are only interested in equal trade opportunity after more adventurous nations have made that trade possible through loans. It is equally nonsensical on our part to contribute $15,000,000 annually for the spiritual and educational uplift of a people and then refuse them a few millions for progress. The statement stands uncontradicted, that for every dollar the American merchant, manufacturer and trader takes out of China in profits, our philanthropists return two dollars for uplift work. We gladly spend millions to save the souls of the Chinese and elevate their moral and educational tone, but not one cent to better their economical status. Of all the impractical and foolish policies, the American attitude towards China challenges comparison.

Americans have still time to revise their ideas and get together for the formulation of some concrete program that will balance the labors of other nations in bringing material benefits to the Chinese and their own trade. The road to Szechuan is a long one. It will cost many millions, but once built will open a new empire to commerce. When the natural resources of Szechuan are tapped and the wheels of industry are working up its raw materials into manufactured products, when the mines are opened and the water power harnessed, Americans will be so occupied with new development projects that they will have no time to worry about what England is doing in South China or what Japan is doing in Manchuria. Their hands will be full.

Can it be done? It can. Scrap all our other railway schemes and let American bankers, merchants, chambers of commerce and philanthropists combine with its government on a campaign to build the line to Szechuan. Get behind "Bill" Carey. Furnish the money. Start him shovelling dirt and before we know it the Chengtu Limited will be pulling out of the Hankow station to the cry of "All aboard for Szechuan! It is a good American program. Let's go!

* * *

"Tommy Atkins" on the Roof of the World

Picture No. 6: The Eldorado of Asia

The Price of American Admission

SIGNS are not lacking that Central Asia will loom large in international politics during the next decade. The rivalries of Russia and England in Tibet and Turkestan, the impotence of China, the absence of communications and a general hostility on the part of the natives towards all foreigners have combined to maintain these regions a closed preserve. But the world is marching on. It needs raw materials, new mineral deposits, new oil fields and new outlets for its surplus capital and energies. The adventuresome white man will eventually locate these riches and stake them out for his own. Tibet, Western Szechuan, Chinese Turkestan, Mongolia and the Altais are more and more coming into the limelight, and with wireless telegraphy and aerial navigation the day is not far distant when these last frontiers will be crossed and their hidden Klondykes compelled to yield up their treasures.

The Germans have their eyes on the Altais. Their mining experts have reported favorably on the mineral deposits of this region, and Moscow has granted an extensive concession to the Stinnes interests. An American company with headquarters at Peking controls a vast gold mining concession which covers half of northern Mongolia. Out in far off Chinese Turkestan, the British have been investigating. They have a consul at Kashgar who keeps in touch politically and commercially. Last year the Marconi Company erected a wireless station at Kashgar. Major Dockray, the engineer, reports that the country is full of oil. The basin, he states, is thousands of miles in area, a continuation of the world-famous Baku oil fields. He asserts that Turkestan is the greatest potential oil golconda of the world; the fields of Pennsylvania would be lost in one corner of the Turkestan field. Oil shale is found everywhere with visible evidences of vast deposits on all sides. Several plants are being operated by the Chinese on a small scale with crude machinery. Two plants are under the supervision of a noted Russian oil authority.

The only logical outlet for these fields at present is via Russia and this in turn is possible only after China recognizes the Soviet. Major Dockray is now in London interesting capital in developing these deposits, one of the biggest deals that modern finance can engage in. It is safe to say that if his reports are borne out, the British will find some way to corner this immense treasure and it is equally safe to say that America will not participate until the British have done the preliminary work when they will invoke the doctrine of equal opportunity. There is only one way for Americans to get into Central Asia and to do so we will once more have to get behind "Bill" Carey and back him morally, financially, diplomatically and in every other way while he builds the Mongolian railways originally contracted for by him with the Chinese government, and which Russia prohibited as soon as he had completed the surveys and was ready to start work. Some day the oil supply of the world will come from Central Asia and America should be willing to take a sporting chance in reaching the deposits.

Let us turn to Tibet. It is filled with gold. The districts between Lhasa and the Chinese frontier in what is known as Western Szechuan, are said to be exceptionally rich in the precious metal. The upper reaches of the Yangtsze are known to the natives as the river of Golden Sand. The mother lodes are located somewhere in the Forbidden Land. Tibet is a dependency of China, but in 1914, it came under nominal British protection, in fact, British influence at Lhasa is now paramount. There is a British post-office in the capital of the Dalai Lama. Tibetan artillery officers are training with the Indian army. Modern arms are superseding obselete weapons. An arsenal is operating at Lhasa turning out Mauser rifles. A domestic postal service has been instituted, telephone and telegraph instruments are installed and a hydro-electric plant to light the capital has been contracted for. Youths have been sent to England for training as mining engineers, some of whom have returned and are out locating gold deposits.

Events are transpiring in the Forbidden Land and as usual the British authorities know exactly what is going on and keep their own counsel. It may well be that even the government at London is maintained in ignorance of just what the Indian authorities are doing.

A civil war is progressing, with the Dalai Lama backed by the British and the Tashi Lama a fugitive in Mongolia, under the protection of the Chinese where he is said to be organizing a force for the capture of Lhasa. Britain is closely watching developments. Her political agents in Kashgar and Western Szechuan and the Intelligence officers of her Indian army know every move made by Russia and China. They are watching the progress of the Germans in the Altais. Some day the British government will take its own steps for the proper protection of the northern and north-eastern frontiers of India and send another Younghusband expedition to the sacred capital of Buddhism. An end will then come to China's shadowy hold on Tibet. A British resident will sit beside the Dalai Lama, and Tibet will be opened to development. The Tibetans will go the way of the North American Indian. China may protest to the League of Nations or the Hague but paper invectives on the part of other powers will not stop Tommy Atkins from sitting on the roof of the world and collecting the price of admission. There is only one way for Americans to crawl under the ropes and get a free seat. An American railway into Szechuan will find us comfortably installed in the front row of the circus when the band begins to play.

* * *

The Perils of Mah Jong

MAH JONG sets figure prominently in the trade returns between Shanghai to the United States. The exports last year are valued at $1,505,000, or one-sixth of the total Shanghai exports to America. Just when the business is beginning to show a profitable return, the inevitable campaign against it as a new gambling vice is being initiated in America by returned missionaries. "The curse of China," one missionary characterizes the game and goes on to relate how the coolies gamble thir last cash, even their clothes and sampans; therefore the game is disastrous to the morals of the people. Now the report is being circulated that mah jongg players in America are being poisoned, and the *Journal of the Association of Medicine* and the *Medical Times* officially recognizes the disease. The New York physician credited with discovering it last December says:

"It is nothing but ivy poisoning. The Japanese and other Orientals use poison ivy in making certain kinds of lacquer. When that lacquer is handled it may cause poisoning even if years or centuries have elapsed since the juice of the ivy was made into lacquer." A Japanese specialist, he adds, "tells of cases of ivy poisoning caused by contact with antiques to which lacquer had been applied 400 or 500 years before."

It appears, however, that the mah jongg players easily can protect themselves from danger of poisoning. The tiles themselves are said to be harmless. Only from contact with the lacquered containers are they likely to pick up "enough of the poisonous material to pass it on to persons who are very sensitive."

Some persons are reputed to be so sensitive to poison ivy that they become infected simply by the wind from it. May be the winds in mah jong should be abolished when sensitive persons are playing.

The danger from Ningpo varnish and the injury to the pocket when some gay player lays down a limit hand that runs into millions of points, together with the propaganda of the missionaries makes the game delightfully hazardous.

* * *

IN REMEMBRANCE

Richard Nettleton Goodwin

Late Managing Editor of "The Pinang Gazette"

A GOOD newspaperman has gone. Richard Nettleton Goodwin, managing editor of the *Pinang Gazette* has passed away in England. We knew Goodwin during the Spanish-American war days when he rendered a service which saved an American journalist from a Spanish military court, a blank wall and a firing squad and in doing so exposed himself to a similar fate, a story of Anglo-American good-fellowship that Goodwin was too modest to refer to.

A few weeks before the outbreak of the Spanish-American conflict the *New York Herald* requested *The Daily Gleaner* of Kingston, Jamaica, to send a man to Puerto Rico to act as its correspondent. This gentleman, a Mr. Halstead, overstepped the proprieties by photographing the fortifications and was promptly arrested and lodged in prison as a spy. The British government for some reason refused to help him and *The New York Herald* after printing the news dispatch concerning his arrest and incarceration lapsed into silence. Halstead remained in prison for the duration of the war, being released when the American flag was raised over San Juan.

Another member of *The Gleaner's* staff was sent to take Halstead's place. The new man was Goodwin. About ten days before the declaration of hostilities the correspondent of one of the big New York dailies blew into San Juan from Habana with orders from his chief to charter or purchase a steamer, yacht or tug-boat and get out and locate the Spanish fleet then somewhere in the Caribbean. The Spaniards soon divined what the correspondent wanted with a steamer, so the captain general issued a *bando* prohibiting the transfer of any vessel then in Puerto Rican waters and ordered that no clearance papers for a foreign port be issued to any vessel under 100 tons burden. The correspondent wired his office that there was nothing doing in the chartering line and the censorship was so strict that no news of interest was permitted to pass.

Somebody in that office was evidently peeved over the fact that *The Herald* had a man in jail as a spy and decided that it would make a great story if an American correspondent was arrested on the same charge. So this brilliant strategist telegraphed the correspondent in open English, "If other news impossible, send descriptions of fortifications or anything lively." He started something. Right there the Spanish secret police awoke from their siestas and gave that correspondent the liveliest experience of his young life.

The Spaniards had an old score to settle with that particular newspaper man. For over two years a price had been placed on his head in Cuba where he had crossed and recrossed the Spanish lines on many occasions with the secret police trying hard to get him. The chief of police of Habana warned his colleague in San Juan to keep an eye on him. The telegram from New York classified him as a spy and from the moment of its receipt his every move was shadowed. The entire secret service force was placed on the detail, changing men every few hours. Fortunately, the correspondent had a Puerto Rican friend, head of the independence junta, an American educated dentist by the name of Del Valle—afterward mayor of San Juan. Del Valle had his own sources of information and knew every move made by the police. He pointed out to the correspondent the different sleuths as they appeared on the job and together they hid in doorways and shops after turning a corner and laughed at the detectives as they came around in a hurry and asked passers-by if they had seen *el Americano*. One by one the various members of the secret service force reported at headquarters that the *Americano* had tricked them. Finally, the chief of police sent out his best man, a flashy coffee and cream colored gentleman whose connection with the police was known only to insiders. Del Valle spotted him. When cornered, he grew insulting. He followed the American into the hotel and up to his room. He there grew abusive, with the result that he landed on his head at the bottom of the stairs. He swore to be revenged.

Within the hour Del Valle came hurriedly into the hotel with the news that the *Americano* was to be arrested as a spy. The chief of police was furious. So was the captain-general. They decided to make an example of the correspondent but did not care to court publicity by an open arrest. Four men were detailed to watch the Hotel Ingles and nab him when he came out. The American was in Goodwin's room when Del Valle told his story verifying it by pointing out the window to the sleuths lounging around the door of the post-office across the way.

It was then eleven o'clock at night. Arrest as a spy with war only a few days away could have only one ending. The correspondent had no ambition to ornament a Spanish dungeon or be led blindfolded to the fosse of Morro Castle in order to gratify the whims of a fool editor sitting comfortably in New York waiting to spring a sensational news story. The chances, however, were all in favor of his becoming a martyr to hectic journalism. It was impossible to escape by boat at that time of night even if one could be obtained. The nearest neutral island was 150 miles away. Escape into the country on a horse or in a carriage would afford only a temporary respite from capture. The city of San Juan is built on a small island with the highway into the country passing over a draw-bridge embellished at each end with a sentry-box. The only hope of immediate escape lay in crossing that bridge and reaching the east coast at Humacao by daybreak and there bribing some smuggler to land him at St. Thomas. The first thing, however, was to elude the vigilance of the sleuths outside the hotel, and cross the bridge without detection. It seemed a hopeless job. The American saw the doors of Morro Castle closing on him in the morning and was prepared to brazen it out.

At this point, Goodwin spoke up: "why it's easy enough. You can't escape by water. You can't use a horse or a carriage. You cannot walk far without being caught. There is only one way left. I have a new nickel-plated bicycle and have been riding around taking notes since my arrival. The main road leading out of town and across the bridge is down grade. Extinguish your lamp and pedal like hell. The night is dark and no-one can see or hear you. Once across the bridge the road is clear as far as Caguas. You can do that before morning. Leave the bike there and I will call for it some day when I have time." But, said Del Valle, "if it becomes known, the police will grab you and put you in jail with Halstead, if they don't do worse for aiding a spy to escape"

"I'll risk that," said Goodwin.

It was one chance in a thousand. The only chance. It was arranged that Del Valle and Goodwin should go out of the hotel by the main entrance, hold the police in conversation while the American sneaked down the servant's stairs and out through a side door used exclusively by tradesmen. If all went well, the three were to meet at the Plaza Colon under the statue of the grand admiral. The scheme worked. The police, thinking it was the American coming out, gathered around Del Valle and Goodwin and plied them with questions. Goodwin explained that he was going home with Del Valle and take a spin on his bike in the cool of the evening. It was all very regular and the detectives permitted them to proceed. In the meantime, the American slipped down the stairs and out through the side entrance without being seen.

The three met at the appointed rendezvous and as the clock in the cathedral chimed out the hour of midnight the American held out his hand and said good-bye to his friends. As he mounted, Goodwin slipped a .38 Smith & Wesson into his coat pocket, saying "you may need it, old top." The American disappeared into the darkness and remembering Goodwin's advice pedalled down the long grade past the barracks, past the prison and over the draw-bridge like a streak of greased lightning. Three times the startled Alto! Quien Vive! rang out as the dim shadow flew past but the rider was far away and lost in the darkness before the challenge was finished. He made the town of Caguas by daybreak and after a series of adventures with the Spanish authorities at Humacao, Vieques and Culebra was dumped out of a smuggler's boat at 3 a.m. on the beach of the Danish island of St. Thomas. In Vieques, the military became suspicious and the American had to slip out on the mail sloop for Culebra, where he paid a smuggler $200 to take him to St. Thomas. As the open boat crept out of the shadow of the land in full view of the lighthouse, its occupants could see the night heliograph flashing from the mainland and the answering signals from Vieques and Culebra. The smuggler developed a case of cold feet and started to head back for the cove. Arguments were of no avail. More gold failed to interest him. So the correspondent resorted to persuasion. For five hours he sat in the bow of the boat with Goodwin's thoughtful present silently keeping the smuggler headed on an eastward course. The Smith & Wesson carried the American over the last lap of a hazardous journey.

At St. Thomas the correspondent reported to his office as follows: "Arrived. Puerto Rico hot. After your fortification message, police surveillance. Eluded vigilance, midnight, bicycle, coach, horse, schooner, sloop, smuggler's boat, here." It was not the story they were expecting in New York. In fact, it was a disappointment. However, it stands as a classic of laconism in American journalism.

After waiting until nine o'clock in the morning for the American to come out of the hotel, the chief of police grew suspicious. He came personally to ascertain the cause of the delay in executing his orders. The sleuths on guard swore by all the saints in the calendar that the *Americano* had not left the hotel. Feeling that enough time had been wasted, the chief marched up the stairs to carry out the arrest in person. A knock on the American's door bringing no answer, the police entered to find the room empty. They then routed out Goodwin and applied the third degree. He knew nothing. He said he had gone home with Del Valle the night before and returned shortly after midnight. Every room and corner of the hotel was pried into. Then the whole force visited the harbor. No boats had left during the night. Not even a fishing smack had passed the lighthouse. All steamers and vessels were searched. The night resorts and other places which might shelter a stranger were inspected. The livery stable keepers testified that no coach or horse had been hired after ten p.m. The sentries on duty along the main road to the bridge swore that no one had passed them during the night. A house to house search followed, but after three days they gave it up. The chief of police reported to the captain-general that the American had simply disappeared. He was promptly discharged for incompetence and the military authorities took over the quest.

The American reached St. Thomas twenty-four hours after war had been declared with the heliograph flashing instructions to the coast guards and garrisons to shoot him on sight. It could never have been done without Goodwin and his bike or the Smith & Wesson he shoved into the American's pocket as a parting gift. Goodwin himself had a narrow call. A quarter century has passed and over the lapse of years the American acknowledges the debt and salutes his British comrade who has passed on.

* * *

Hydro-Electric Project for the F.M.S.

ONE of the most important electric power developments in the Far East is the scheme for building a hydro-electric installation and dam across the Perak River near Batu Gajah in the Federated Malay States the plans for which are now being drawn up by the great British engineering firm of Armstrong, Whitworth & Company, Ltd. An abundant supply of hydro-electric power can be obtained from this river, and the extensive tin mines in the Kinta Valley in the district of Larut, together with the Federated Malay States railways would provide ample outlet for the power which could be generated.

The Perak River at Parit is within 8 miles of Batu Gajah, which is regarded as the centre of the Kinta mining fields. Surveys have been made of a dam site above Enggor, which is the most promising of all the localities considered. The transmission lines from this site would run close to good roads and railway lines, thus cheapening the cost of construction and maintenance.

If later on, further power should be required, other dams could be built across the same river higher up. The potential power available is estimated at about 20,000 kilowatts from the Perak River only, which is sufficient to take care of all anticipated needs.

Local engineers recommend that generation should be three-phase, 50 or 60 cycle alternating current, stepped up to 66,000 volts for transmission. Substations should be installed throughout the area of supply, where the pressure will be stepped down to 416 volts between phases, or to any other voltage that may be required by any large consumer. It is further recommended that outdoor substations be installed wherever practicable, both on account of a very marked saving in construction cost and to reduce the ill-effects of accidents or improper handling by indifferent labor.

It is too sanguine to assume that all the mines will change over to electric drive, though there is little doubt that in time more power will be installed in the mines. Generally, it may be assumed that in a few years a demand will arise for about 30,000,000 kilowatt hours per annum, rising later on to a considerably higher figure.

With the completion of the scheme of supplying hydro-electricity from the Perak River, not only will it be possible to supply every mine in Kinta and Larut with power, and every town in

Kinta with light, but it will also be possible to supply the new port at Prai. Indeed, with the coming of a really large hydro-electric installation on the banks of the Perak River, there should arise many electrifications besides that which will make the Kinta Valley one huge tin mine. It might mean that trams would be run between Ipoh and near-by townships, and the possible linking of Ipoh and Lumut by an electric railway, with the development of Lumut as a port.

* * *

American Economic Interest in Tropical Asia

Last year the United States sold $49,691,877 worth of its products—largely manufactures—to India and Malaysia (including British India, Straits Settlements, and Dutch East Indies). The year before we sold $43,456,210 worth to these countries. In that same year, however, these countries bought approximately $728,000,000 worth, principally of manufactured products, from Europe.

The things we sold them were chiefly manufactures in which we specialize for export, including automobiles, machinery, iron and steel products, hardware, electrical apparatus, machine tools, typewriters, etc. The demand for such products, however, only came after their demands for the necessities which Europe sold them had been satisfied.

Cotton goods constitute one-third of the normal imports of these countries year in and year out. We scarcely participate in this trade. Dyestuffs, for cotton goods locally manufactured in India, form an important demand from abroad. Generally speaking, we do not compete in this field. Chemicals form an important item of European sales, while we get only a small fraction of the trade. Great Britain sells India twice as many boots and shoes in normal years as we do.

Our product is as good as, and in many instances it is better than, the European. Our prices are too high, however, and we have not the requisite organization to sell the product on its quality. We simply permit it to be bought. If it will not sell itself we seek other markets.

In 1922 these countries sold $1,860,000,000 worth of their products to the world and bought $1,474,000,000 worth of goods. The trade of the Dutch East Indies and Straits Settlements was practically balanced between exports and imports. The trade of India, however, showed an excess of exports of $369,000,000. This came about by excess sales to the United States of $70,000,000, and to countries in the Far East, Latin America, and Africa of $378,000,000—a total of $458,000,000, which was reduced $89,000,000 by excess purchases from Europe. This "favorable" merchandise balance of India's trade was liquidated in 1922 by net imports of gold and silver amounting to $382,000,000. This does not remain in circulation, but is melted down and hoarded by the people. By the modern alchemy of commerce, India is turning jute, tea, cotton, oilseeds, and other agricultural products into silver and gold.

The problem confronting those manufacturers who would sell more of our specialties to this region, therefore, is simply one of turning this precious metal into better roads, to encourage purchases of more automobiles; into factories making low-priced necessities, to encourage purchases of more machinery and machine tools; into railroads and buildings, to use more steel products; into electric power plants, to open markets for more electrical apparatus; and into greater literacy, to increase the demand for typewriters. Our whole economic policy in this region should be directed toward higher standards of living and the productive investment, instead of the hoarding, of wealth.—FRANK R. ELDRIDGE.

* * *

The S.M.R. Solves Japan's Oil Problem

THE Japanese are always doing something worth while in Manchuria. After inventing a special reduction process that will solve the problem of working at a profit the low-grade iron ores of Anshan and drawing up plans for the erection of a new reduction plant and a 200,000-ton steel mill, they have turned their attention to the development of the shale deposits at Fushun from which an inexhaustible supply of petroleum can be obtained. The extraction of oil from shale has generally proved a failure as a commercial proposition, the only single exception being in Scotland. Here, according to the latest reports from England, there is considerable apprehension amongst the workers that the industry may be summarily closed down owing to the unsatisfactory financial position of the industry, as revealed in the report of Sir Charles Greenway, chairman of the Anglo-Persian Oil Company. The president of the board of trade, however, has assured the workers there is no immediate danger of the industry reaching a position where the question of closing down would arise.

The South Manchuria Railway Company has pinned its hope on the success of the Scotch industry and have carried out experiments in conjunction with the Japanese naval authorities which have proved quite satisfactory. From these experiments it is calculated that about 79,000,000 gallons of petroleum per year can be profitably extracted from 2,000 tons of shale per day. The oil shale at Fushun is found in the upper strata and at least two thousand tons per day have to be removed to get at the coal. In other words, the shale is obtainable practically free of mining cost, while the ammonia sulphate and the other by-products will help to make the enterprise profitable.

Mr. Kawamura, president of the South Manchuria Railway Company, is now in Japan conferring with the naval and finance authorities as to the best means of raising the capital required for installing the plant. It is estimated that some Y. 50,000,000 will be needed to cover equipment expenses over a period of three years. It is understood that in the conferences with the home authorities, the South Manchuria Railway Company has agreed to furnish the capital, and in the first year appropriate Y. 10,000,000. The company's budget for the new fiscal year is fixed at Y. 49,000,000, an increase of Y. 25,000,000 over the previous year. The plan having been approved by the home government, only the question of raising the capital remains to be solved. It is hoped that the imperial authorities will join in the enterprise and appropriate Y. 10,000,000 towards the cost of installation.

The Japanese navy uses about 500,000 tons of petroleum per year and steamship and other private enterprises, another 300,000 tons. It is pointed out that the home production of petroleum is small and with America restricting exportation, the Japanese navy and industries will soon face a serious shortage of fuel. It is estimated that the Fushun shale will supply the home requirements to the extent of at least 400,000 tons thus relieving the strain and assuring to Japan an oil supply that will place her in an independent position in case of emergency.

* * *

Chinese Machinery Market Contracted

By W. H. Rastall, Chief Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

Supplementing article "Competition for Machinery Trade of China," appearing in the March Number of "THE FAR EASTERN REVIEW."

THE Chinese machinery market, so far as the Shanghai business is concerned, contracted substantially in 1923 from the previous year, according to cabled information from Commercial Attachê Julian Arnold at Shanghai.

The value of all machinery imports into Shanghai amounted to 12,900,000 haikwan taels in 1923, as compared with 26,601,000 haikwan taels in 1922.

The figures for the various kinds of machinery imports follow:

The above figures show that during 1923 the imports of textile machinery into Shanghai decreased to about one-third of the value of the previous year; and that electrical and certain other classes of machinery declined to less than one-half the value of the 1922 imports. Propelling machinery and the miscellaneous groups, however, maintained, and even slightly increased, their volume.

Shanghai Percentage of Total Imports

In 1910, machinery imports through Shanghai were about one-sixth of the total imported into China; but since 1920 Shang-has received more than one-half of the total, according to final figures of the Chinese customs. (The figure for Shanghai imports in 1922 is different from that given in the preceding table, which was based on preliminary returns of the Chinese customs.) The figures for 1910-1922, inclusive, follow :

Machinery Imported into Shanghai.

Kinds.	1922 *Haikwan taels.*	1923 *Haikwan taels.*	1923 percentage of 1922 trade.
Textile	17,789,000	6,347,000	35.68
Electrical	2,899,000	1,223,000	42.19
Propelling ..	844,000	865,000	102.45
Miscellaneous ..	1,197,000	2,267,000	105.88
Other classes ..	3,872,000	2,198,000	56.76
Total ..	26,601,000	12,900,000	48.5

Industrial Machinery Imports into China.

Year.	Total imports into China. *Haikwan taels.**	Total imports into Shanghai. *Haikwan taels.**	Shanghai's percentage of total imports.
1910	10,886,065	1,814,906	16.67
1911	6,697,265	919,123	13.72
1912	4,558,988	1,037,805	22.76
1913	7,089,677	1,420,666	20.03
1914	8,253,968	3,886,942	47.00
1915	4,468,760	2,138,941	47.86
1916	5,970,263	2,141,966	35.87
1917	5,367,108	1,969,428	36.69
1918	7,415,071	2,693,380	36.32
1919	14,205,153	5,571,748	39.22
1920	22,038,508	11,774,586	53.43
1921	54,487,677	30,632,313	56.22
1922	49,602,045	27,644,033	55.73

If the above returns were expressed in dollars, the volumes would look very different, on account of the great fluctuations in the exchange rate of the haikwan tael.

Shanghai Imports by Countries of Origin

Over one-half of the machinery imported into Shanghai in 1923 came from Great Britain. Figures for the various countries of origin are as follows :

Shanghai Machinery Imports in 1923, by Countries of Origin.

Countries.	Haikwan taels.	Percentage of total trade.
Great Britain	6,549,000	50.7
United States	2,181,000	16.9
Japan	1,868,000	14.5
Germany	1,600,000	12.4
Other	702,000	—
Total	12,900,000	—

In the article published in the February 4 issue it was shown that for all of China in 1922 the British participation was 44.8 per cent. ; the American, 23.3 per cent. ; the German, 5 per cent. ; and the Japanese, 18.3 per cent. The latest cable suggests that there has been a serious decrease in the volume of business secured by Japanese and American interests in China, while Great Britain, Germany, and certain other countries have increased their participation in this trade—all of which emphasizes the statement previously made that American manufacturers should give very serious attention to their decreasing participation in the machinery trade of China. Inasmuch as conditions in China are duplicated to a certain extent in other countries, manufacturers will also find it desirable to review their foreign sales policies.

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*The par value of the Haikwan tael is $0.8255.

What the Earthquake Did to Japan's Railways

An Official Estimate of the Losses

THERE are over 8,450 miles of railway in Japan, of which about 6,500 miles are under government direction. The building program provides for an additional 6,000 miles, of which 900 miles are private projects. As a result of the severe economic strain on the financial resources of the empire arising from the disaster of last September it is doubtful if any material progress will be made in the immediate future in carrying out the above program, and the millions for new construction will be diverted to the repairing of damaged lines and the acquisition of new rolling stock to replace that destroyed by fire and quake.

The damage to the railways in the affected area varied from land slides and collapsed bridges and tunnels to the complete disappearance of every vestige of railway property.

The conflagrations in Tokyo, Yokohama, Yokosuka, Odawara, and Kamakura wiped out stations, trains, offices and warehouses. In fact, the Japanese government railways suffered heavily from the disaster ; cracking, collapsing, and slipping of the lines and tunnels, destruction of railway bridges, derailment and overurning of trains, burning of rolling stock, stations, workshops, etc. The railway administration building in Tokyo was completely consumed by the flames, and the interference with the working of the transportation system thus caused extended more or less to the entire system of the government and private railways.

The Japanese government railways not only were unable to earn the expected revenue during the period but were obliged to expend about Y. 80,000,000 for the immediate repair of the damage. Private railway and tramway companies in the districts affected by the disaster were none of them exempt ; their estimated loss amounting to about Y.25,500,000, and the expenditure for rehabilitation being estimated at about Y. 8,100,000.

DAMAGE TO LINES AND BUILDINGS.

A. Lines.

(*a*) Damage. In Tokyo and Yokohama a large number of sleepers were burnt, and the sections upon which damage was done are as follows, the entire length being estimated at about 420 miles :—

The Tokaido Main Line, Tokyo-Gotemba : The Yokosuka line, the Yokohama line, the Atami line, the freight line in the neighborhood of Yokohama and Hiratsuka, the Yamate line.

The Central Line : Tokyo-Kokubunji and Asakawa-Nirazaki.

The Northeastern Line : Ueno-Kawaguchimachi, Kuribashi-Kokawa, and the freight line to and in the Akibahara station.

The Joban Line : Nippori-Torite, Tabata-Sumidagawa, and Kitasenju-Sumidagawa.

The Sobu Main Line : Ryogokubashi-Kamedo and Funabashi-Naruto.

The Boso Line : Chiba-Oami.

The Hojo Line; *The Kururi Line.*

The Narita Line: Narita-Shimousa-Matsuzaki and Fusa-Kohoku.

The greatest damage of all of the above occurred upon the Atami line, and the section between Hayakawa and Manazuru is not yet reopened for traffic. A considerable number of days were required for the resumption of traffic over the bridge across the River Banyu between Chigasaki and Hiratsuka, through Tunnels Nos. 3 and 4 between Yamakita-Suruga on the Tokaido main line and one between Yose and Uenohara on the central line, etc. etc.

DATE OF RESUMPTION OF TRAFFIC.

I. Sections and dates on which steam trains resumed service.

The Tokaido Line:

Tokyo—Shinagawa, Sept. 18; Rokugo, Sept. 4; Tsurumi, Sept. 5; Higashikanagawa, Sept. 6; Yokohama, Sept. 7; Ofuna, Sept. 8; Fujisawa, Sept. 11; Chigasaki, Sept. 12; Hiratsuka, Oct. 21 (connection on foot from Sept. 13); Oiso, Sept. 9; Ninomiya, Sept. 11; Kozu, Sept. 13; Yamakita, Sept. 21; Yaga, Oct., 28 (connection on foot from Sept. 21); Gotemba, Sept. 21.

Tsurumi—Takashima, Oct. 7; Higashi-Yokohama, Sept. 12; Yokohama-minato, Sept. 26; Higashi-Kanagawa, Sept. 12; Takashima, Sept. 12; Hodogaya, Oct. 3.

Kawasaki—Hama-Kawasaki, Oct. 17.

The Yokosuka Line:

Ofuna—Kamakura, Sept. 9; Zushi, Sept. 10; Taura, Sept. 13; Yokosuka, Oct. 1.

The Yokohama Line:

Higashi-Kanagawa—Haramachida, Sept. 28; Hachioji, Sept. 20.

The Atami Line:

Kozu—Odawara, Oct. 15; Hayakawa, Nov. 15; Manazuru, not yet reopened.

The Yamate Line:

Shinagawa—Tabata, Sept. 4; Ikebukuro—Akabane, Sept. 4 (withdrawn since Sept. 8).

The Central Line:

Tokyo—Manseibashi, Sept. 24 (withdrawn since Oct. 6); Iidamachi, Oct. 5 (withdrawn since Oct. 6); Shinjuku, Sept. 4; Hachioji, Sept. 4; Yose, Sept. 4; Uenohara, Oct. 25 (connection on foot from Sept. 7); Torisawa, Sept. 7; Enkyo, Sept. 5.

The Northeastern Main Line:

Ueno—Nippori, Sept. 22; Kawaguchimachi, Sept. 4.

The Joban Line:

Nippori—Kitasenju, Sept. 1.

The Sobu Main Line:

Ryogokubashi—Kinshicho, Oct. 8; Kamedo, Sept. 21; Inage, Sept. 1; Chiba, 2; Sakura, Sept. 1; Naruto, Sept. 3.

The Boso Line:

Soga—Toke, Sept. 16; Oami, Oct. 17.

The Hojo Line:

Soga—Goi, Sept. 1; Kisarazu, Sept. 4; Onuki, Sept. 6; Sanocho, Sept. 11; Kazusa-minato, Sept. 14; Hoda, Sept. 11; Iwai, Sept. 14; Tomiura, Sept. 28 (connection on foot from Oct. 14); Kokonoe, Sept. 23; Chikura, Oct. 16 (connection on foot from Oct. 16); Emi, Sept. 27.

The Kururi Line:

Kisarazu—Kururi, Sept. 24.

III. Sections and dates on which electric trains resumed service.

The Tokaido Line:

Tokyo—Kamata, Oct. 1; Yokohama, Oct. 21; Sakuragicho, Dec. 30.

The Yamate Line:

Shinagawa—Uguisudani, Sept. 16; Ueno, Ikebukuro, Sept. 23; Akabane, Sept. 21.

The Central Line:

Tokyo—Manseibashi, Oct. 7 (steam trains from Sept. 24 till Oct. 6); Iidamachi, Oct. 7 (steam trains from Oct. 5 till 6); Ushigome, Oct. 21; Kichijoji, Oct. 19; Kokubunji, Dec. 30.

B. Stations, Sheds, Offices, etc.

(*a*) Stations burnt down:—Yurakucho, Shimbashi, Hamamatsucho, Yokohama, Sakuragicho, Higashi-Yokohama, Yokohama-minato, Shiodome, Kanda, Maneibashi, Ochanomizu, Suidobashi, Iidamachi, Ueno, Akibahara, Sumidagawa, Ryogokubashi and Kinshicho.

(*b*) City offices burnt down:—Tokyo and Yokohama.

(*c*) Engine sheds burnt down:—Iidamachi, Ueno, Kinshicho and Tabata.

(*d*) Car Examination Sheds burnt down:—Ueno, Sumidagawa, Ryogokubashi, Shiodome and Iidamachi.

(*e*) Stations greatly damaged:—Kanagawa, Hodogaya, Totsuka, Ofuna, Fujisawa, Tsujido, Chigasaki, Hiratsuka, Oiso, Ninomiya, Kozu, Shimosoga, Matsuda, Yamakita, Konomiya, Odawara, Hayakawa, Nebukawa, Manazuru, Haramachida, Kozukue, Kamedo, Chiba, Susai, Sanukimachi, Iwai, Nakofunakata, Awa-Hojo, Kokonoe, Chikura, Minamimihara and Ushigome.

(*f*) Engine sheds greatly damaged:—Takashima, Yamakita and Awa-Hojo.

C. Railway Headquarters and other office buildings.

(*a*) Railway Headquarters building.

This was burnt down in the evening of September 1 together with attached buildings.

Upon the loss of this building, a temporary office was opened in the Tokyo divisional office building, which escaped from the catastrophe, and later a barrack covering about 500 tsubo was erected, in which office work was begun on October 11.

A new building was completed on November 23 at the former site and office work was commenced on that day.

(*b*) Other Office Buildings.

1st and 2nd Tokyo district improvement office and various other office buildings in Tokyo were burnt down on September 1, and temporary offices were set up in the Tokyo divisional office. On November 24 they were removed to the temporary buildings erected in front of the Tokyo station.

(*c*) Railway Works.

Railway works belonging to the headquarters of the department of railways burnt down:

Official bulletin printing house, clothing shop, and timber treating plant.

D. Official Residences.

(*a*) Official residences extending over 3,393 *tsubo* were burnt down.

(*b*) Official residences temporarily erected:

Shiodome, 82; Ueno, 20; Ishiwaracho, 18; Kinshicho, 16; Iidamachi, 34; Hiranuma, 44; Total area 2,584 *tsubo.*

3. Rolling stock and works damaged:

I. Rolling stock:

		Burnt	Damaged	Total
Engines	Tanks	17	9	26
	Tenders	31	51	82
	Total	48	60	108
Passenger Cars	Bogie cars	308	55	363
	Four-wheeled cars	116	7	123
	Total	424	62	486
Electric Cars	Motor cars	21	—	21
	Trailers	11	—	11
	Total	32	—	32
Freight Cars	Covered	687	203	890
	Uncovered	284	94	378
	Coal cars	—	4	4
	Total	971	301	1,272
	Grand Total	1,475	423	1,898

II. Works:

Kinshicho Works, burnt; Omiya and Oi Works, escaped destruction by fire, but damaged more or less. After repairs, the Omiya Works resumed work on September 7, and the Oi Works on September 8.

"The Future of Mankind May Some Day Depend Upon American-Japanese Friendship"

An Address by Ambassador Cyrus E. Woods Before the Pan-Pacific Club of Tokyo

"IN honoring me with this invitation to address you," said the ambassador, "I feel that you have given me a signal favor. For it seems to me particularly appropriate that it is at a meeting of the Pan-Pacific Club that I should have the pleasure of making my first public appearance on my return to Japan. I say that it is particularly fitting because the aims of the Pan-Pacific Union are at this time of special importance, embodying as they do the constructive aspirations of thinking men on both sides of the Pacific Ocean.

"The recent catastrophe itself, may in this regard, prove to have been a not unmixed evil. For the fortitude with which the Japanese people met such overwhelming disaster, the admirable spirit which this sorely tried nation has shown in the face of what must have seemed to many the almost impossible task of reconstruction, has not only filled the civilized world with admiration, but has also served to strengthen the old and also to forge the new bonds of friendship between Japan and the nations of the world. Of no nation is this truer than of the United States of America. During my recent visit home I was met on all sides with evidences of sincere friendship for Japan and a real desire to help her in her hour of need.

Cyrus E. Woods, American Ambassador to the Court of the Mikado, with Mrs. Woods, calling to pay his Respects to the Prince Regent

"I will, however, ask you, gentlemen, to take my word for this, as it is not upon this particular subject that I wish to dwell upon now. I have referred to the aspirations which animate the Pan-Pacific Union, which are friendship and co-operation between all the peoples of the Pacific Ocean. It does not require any extraordinary acuteness to predict that the Pacific may well be one day the greatest theatre of the world's activities. The Mediterranean, which for centuries was the focus of Western civilization, lost its paramount importance upon the discovery of America and the consequent enormous development of the nations bordering upon the Atlantic Ocean. It incidentally might be contended that is is to the East that we owe the discovery of America, for was it not in their eagerness to find a short cut to India, Cathay and Cipangu that the early explorers hit upon the American mainland?

"For the next 400 years the Atlantic was to be the world's fulcrum. But signs are not wanting that the period of Atlantic preponderance is weakening, and that the Pacific is fairly on the way to take its place. With this imminent shifting of the balance of power, however, there came also heavy responsibilities. If the nations of the Pacific are indeed to become the arbiters of the world's destiny, they are morally bound to see that good use is made of their power. The period of Mediterranean and Atlantic preponderance has been marked by all the bloody wars of history.

"Will it not be possible for the era of Pacific preponderance—justifying its name—to be in truth pacific? In this new era Japan and the United States are destined to play leading rôles. Causes of friction between the two countries are happily fast disappearing and the factors making for good will are ever on the increase. The importance of commercial relations in this regard need hardly be dwelt upon, so obvious are they. The opportunities for augmenting the already great trade on the Pacific, to the benefit of all, are innumerable. But important as this commercial relation may be, and as a Yankee I do not underestimate it, it is in itself not enough to bind the two nations together. The late war was expensive proof of that.

"Besides commercial exchanges then, there must be a mutual exchange of ideas and ideals. In this sphere Japan is in an especially favored position. Is she not in a sense the clearing house between East and West? From the latter she has taken much that it had to give in the way of material achievement, but her ancient spirit she has kept intact. I look to a time when Japanese civilization may become a synthesis for all that is best in the Orient and the Occident, and Japan thus serving as a link between the two, interpreting the one to the other. Surely this is a prospect fine enough to fire the imagination and stir the ambition of the proudest people.

"There is but one plea that I should like to make, and that is that Japan, in adopting the material attainments of the West should go deeper than she sometimes appears to do and strive to understand something of the spirit which underlies these attainments. The accusation of materialism is, I know, often leveled at Western nations and more especially at America; but to take only the United States, the names of Washington and Lincoln, and much recent history besides, should dispose of such a charge.

"There is much too, that we on our side can gain from the age-old experience of Japan and the East, and a realization of these benefits will go far towards cementing lasting friendship between the two peoples. I think it is no exaggeration to say, in conclusion, that upon the friendship and co-operation between the United States and Japan the future of mankind may well some day depend."

Germany's Pre-War Foreign Investments

THE story of the way in which the German people by hard work, by economy, and by keen business acumen that took advantage of every change in the money markets of Europe managed to acquire by 1913 foreign investments valued at 5 billion dollars, only to see them melt away in the fires of war or sink in the slough of post-war days is only one of the interesting bits developed by H. G. Moulton and C. E. McGuire in the report of the institute of economics on the much-disputed question "Can Germany pay ?."

The story goes back thirty years, to 1893, when the Germans had already acquired about 3 billion dollars worth of foreign investments. For the twenty years (1894-1913) they added to this amount at the average annual rate of $100,000,000, but, during the next ten years, 1914-1923, they saw this accumulated 5 billion dollars worth of investments decrease almost to zero.

Before the war the Germans were heavy borrowers of short-term loans in the money markets of Amsterdam, London and Paris ; and undoubtedly they invested in long-term bonds in other countries most of the funds obtained in this way. These borrowings, though made for short terms, really ran for long ones. This was done, not by securing formal renewals from the first lenders, but by repaying the loans with money obtained from other lenders, many times from lenders in other cities. Naturally, in making this sort of "renewal," the borrower sought the market where money was cheapest. A German financial writer estimated in 1911 that these borrowings amounted to 125 to 150 million dollars a year ; and that nearly half of the amount was obtained for investment purposes rather than for financing mercantile operations. Undoubtedly they formed a considerable part of the $175,000,000 that were owed by the Germans to the British when the war broke out and that are still being paid through the clearing-house system set up for the purpose after the war.

Of the five billion dollars worth of investments owned by Germans in 1913, probably all the real property situated in enemy lands and part of the securities deposited therein were seized, the total value so seized by the allies amounting to nearly 3 billion dollars. Most of this property has now been or is being liquidated and the proceeds have been or will be returned to their owners or credited against Germany's reparation debt. Undoubtedly, these proceeds will, however, be much less than the value placed upon the investments by their owners, the total probable recovery being estimated at less than $400,000,000, a loss to Germans of 2½ billion dollars.

The investments which Germans had made in friendly or neutral countries suffered a different fate. Some of them were sold to the nationals of other countries, probably to those of countries which, like the United States, delayed their coming into the war. Most of the proceeds from these were used in one way or another to pay foreign obligations.

During the four years of the war Germany's total imports exceeded her exports by nearly 4 billion dollars. Most of these had to be paid for with gold, foreign money, bills of exchange, or some sort of foreign collateral, for outside of Germany paper marks early ceased to be acceptable. Foreign securities were about the only things available in considerable amounts.

In 1916 a government census of the foreign securities in Germany located over 4 billion dollars worth. The next March the government aoquired complete control over all these; and two months later began mobilizing them, particularly those representing property locyted in Sweden, Denmark and Switzerland, for through those countries came most of Germany's imports.

The entire 4 billion bollars worth locased by this census were disposed of af follows: Exported during the war 1½ billion; sold to purchase feod and raw materials, $200,000,000; depossted abroad and confiscated, 1 billion; reparation papments, $200,000,000; invested in securities of Germany's allies and ot present valueless, $900,000,000; exported since the war, $250,000,000. The last-named item plus whatever may be returned from the proceeds of seized properities constitnte all that remainsof the 5 billion dollars' worth of Gorman pre-war investments.

The New Mitsui Bank

To be Built by American Constructors

THE construction firm of James Stewart & Co. of 30 Church Street, New York, has signed a contract with the Mitsui interests to construct the largest bank building in the Orient, the first important permanent building to be erected in Tokio since the earthquake of last September. The estimated cost is approximately 15,000,000 yen.

The building will be a concrete, stone and steel structure erected on the site of the old Mitsui Bank, and it is expected to set the standards for the best post-quake construction. Preliminary plans call for a building of five stories or more.

The contract was signed by Alexander M. Stewart, chairman of the board, on the part of the American interests.

The building itself will be 415-ft. long by 153-ft. wide and will have either five or six stories. Below ground will be an enormous system of safe deposit vaults. The building will be, according to present plans, the largest structure in the world used exclusively for a banking business. It will house both the Mitsui Bank and the Mitsui Trust Company. The structure will be built of steel and concrete throughout, with a heavy facing of native Japanese granite. It will face three streets, having sixteen enormous fluted Corinthian columns, 76-ft. high on the main front, and eight columns of the same dimensions on each side.

Trowbridge and Livingston of 527 Fifth avenue, New York, are the architects. They were represented in Japan by George W. Jacoby. Steel work will follow plans laid down by S. C. Weiskopf, an engineer, with offices at 11 East Forty-second street, New York.

The Mitsui Bank is one of the largest banking and commercial enterprise in the Orient. The business is more than 800 years old, and has descended from father to son since its foundation. The bank building in Tokio was destroyed during the earthquake.

It is estimated that about $3,000,000 would be spent in the United States for steel, cement and other building materials. Even machinery for quarrying the granite will be shipped from the United States.

* * *

Why American Steel Men are Friends of Japan

A STRIKING record was made in January in the volume of American steel exports, says the *New York Journal of Commerce.* At over 247,900 gross tons they were the heaviest in over three years, the previous largest volume having been in February, 1921. This expansion is further emphasized by the fact that the average steel exports in 1922 and 1923 were only 161,500 and 166,000 tons per month, respectively. The January shipments even exceeded the 1913 average of 242,200 tons per month.

More interesting still, however, is the cause of this sudden expansion. Buying by Japan late last year resulted in accumulated shipments in January in such a volume that over 94,900 tons was sent to Japan in that month, or over 38 per cent. of the total. In this particular instance, heavy reconstruction in Japan due to the earthquake has been the primary cause. In one item alone, black steel sheets, Japan in January took 93 per cent. of the total exports as well as over 83 per cent. of the wire nail shipments for that month.

While the January movement of American steel to Japan is phenomenal the importance of that country as a customer of American steel makers has been pronounced ever since the war. In 1920 over 30 per cent. of American steel exports went to Japan, and in 1923 over 18 per cent. Taking cumulatively the entire record for the five years since the war—1919 to 1923, inclusive—Japan is credited with the purchase of 27.5 per cent. of the total American steel exports for that period.

These facts are impressive evidence of the importance of Japan to America's foreign trade in steel. In fact, without Japan and Canada the American steel export trade would shrink to a volume less than that of even Belgium.

The Day of the Automatic Telephone

New Installations for Shanghai and Tokyo

THE automatic telephone is fast gaining favor throughout the Far East where linguistic difficulties constitute one of the hardest problems in providing efficient service for the public. The first complete automatic telephone system in this part of the world was successfully placed in operation in 1922 at Harbin by the Automatic Telephone Manufacturing Company, Ltd., of Liverpool. Following this came a small 500-line private exchange in Tokyo and then the 5,000-line system in Dairen installed by the same company. The earthquake and fire destroyed 16 out 20 of the telephone centrals in Tokyo and these are rebuilt with the automatic system. Now comes Shanghai with the initial steps towards automatizing its telephone service by the installation of the "Ericsson" system in the east exchange of the Shanghai Mutual Telephone Company, Ltd., which, if successful, will be ultimately extended to all other exchanges operated by this company.

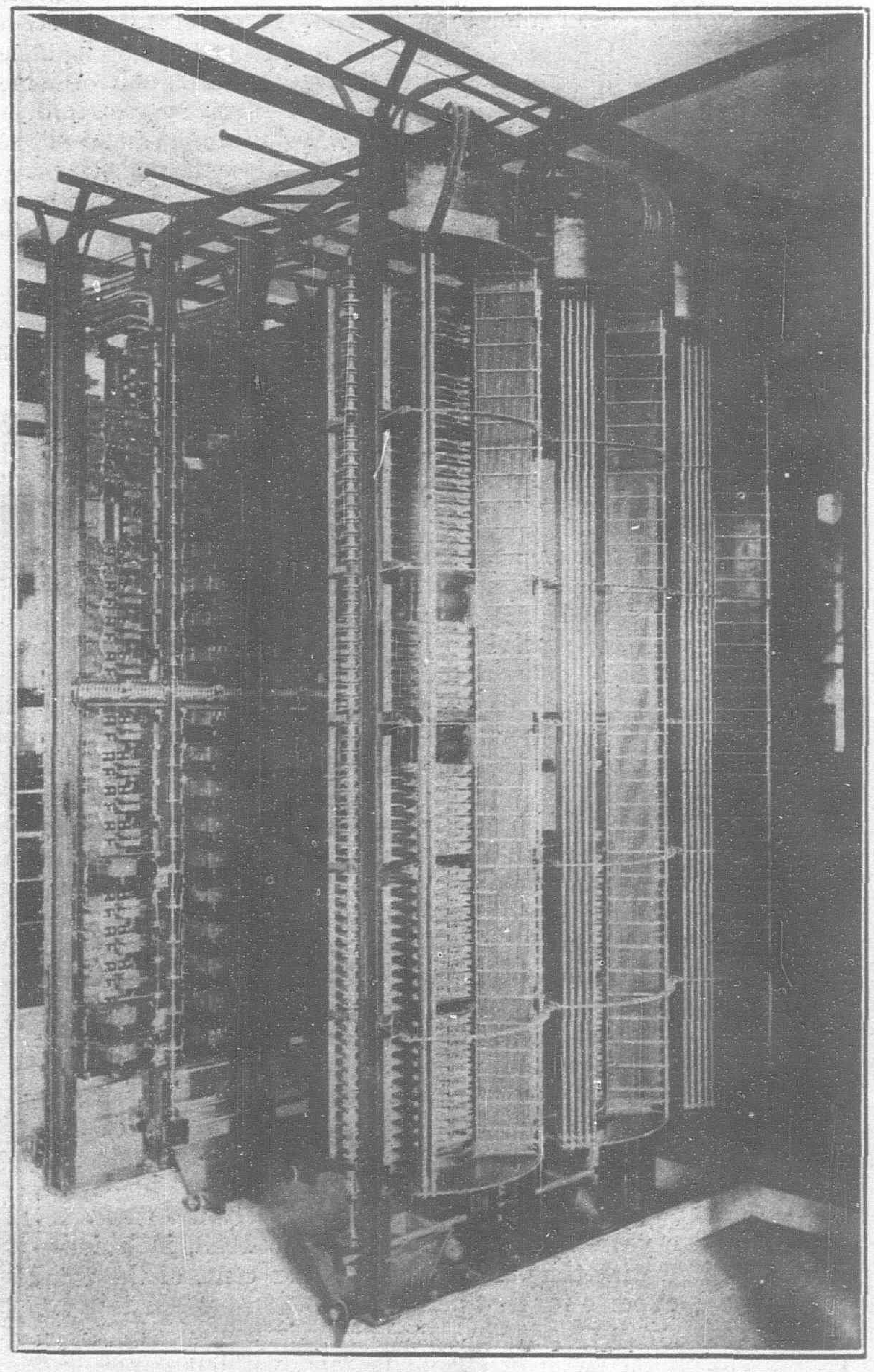
The Shanghai Exchange

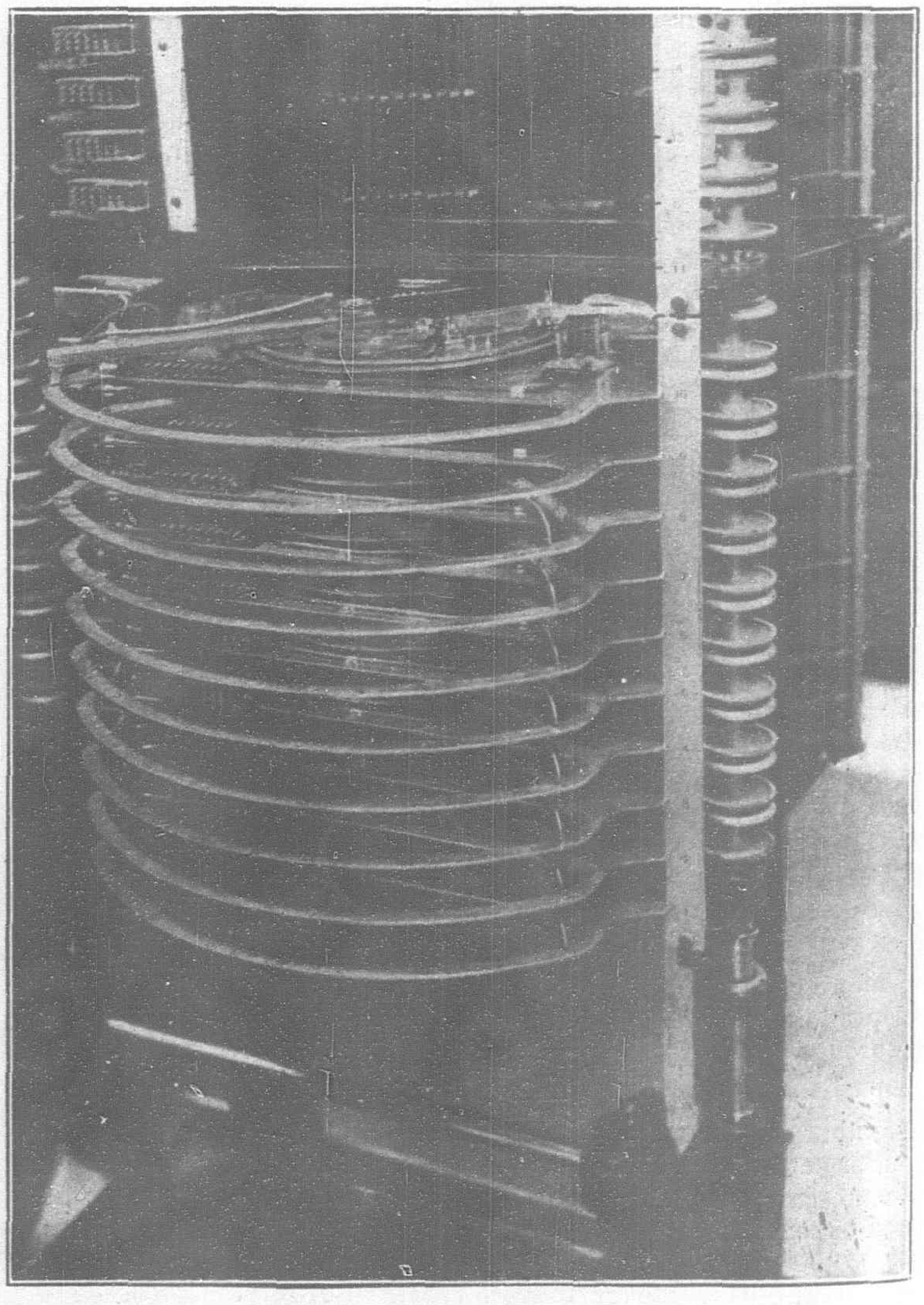
The automatic system replaces the trained human element at the switchboard by a machine, the only operators being the subscribers at either end, the control of a call from start to finish entirely in their hands. No other public service depends so completely on the intelligent and sympathetic co-operation of the public. The telephone lines in a large city are divided into groups called exchanges. In Shanghai there are four such groups, viz., "Central," "West," "North" and "East." When the whole system is automatic these names will be replaced by numerals.

The automatic system now being installed provides for 50,000 telephones, 10,000 of which are allocated to each exchange area with the exception of central, which is allotted 20,000, so that assuming Shanghai will one day go wholly automatic, all

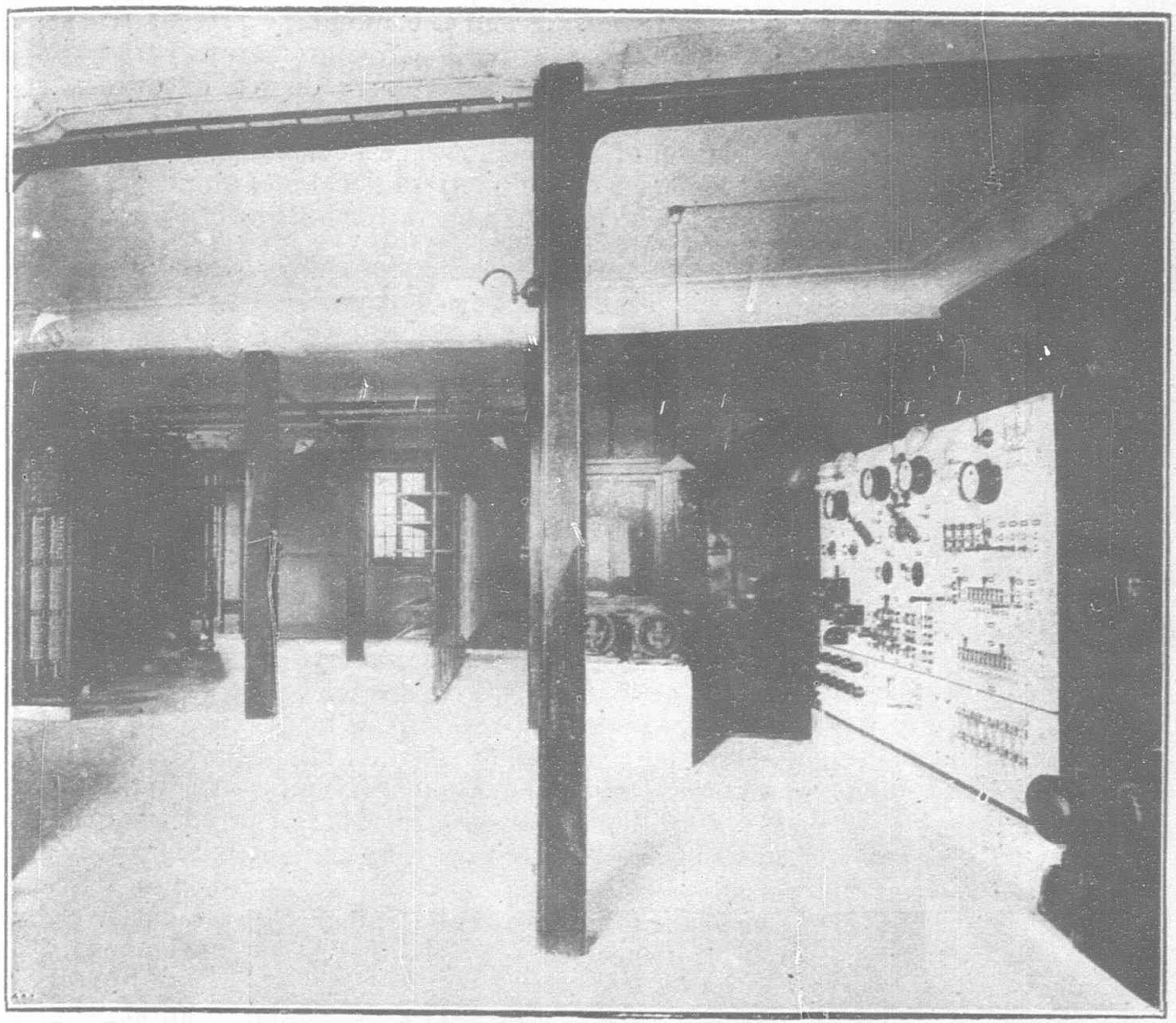
Central numbers will be from 10,000 to 29,999
West ,, ,, 30,000 ,, 39,999
North ,, ,, 40,000 ,, 49,999]
and East ,, are now 50,000 ,, 59,999

The new exchange is situated in the company's premises at 6 Lay Road, Yangtszepoo, the whole of the equipment being installed in one large room which has been specially prepared for the purpose. This room has been made as far as possible, dust proof and damp proof. The telephone lines are led in from the street by cables and terminate on a protective device called an arrestor, for protection against lightning or electric light current contacts. From thence they are divided into groups, numbers 50001 to 50500 being connected to one set of machinery, 50501 to 51000 to another set of machinery, and so on, where they terminate on vertical brass


The Linefinder


Starting Distributor

THE ERICSSON APPARATUS INSTALLED IN THE EAST EXCHANGE OF THE SHANGHAI MUTUAL TELEPHONE CO, LTD.



The Ericsson Automatic Installation in the East Exchange of the Shanghai Mutual Telephone Company, Ltd.

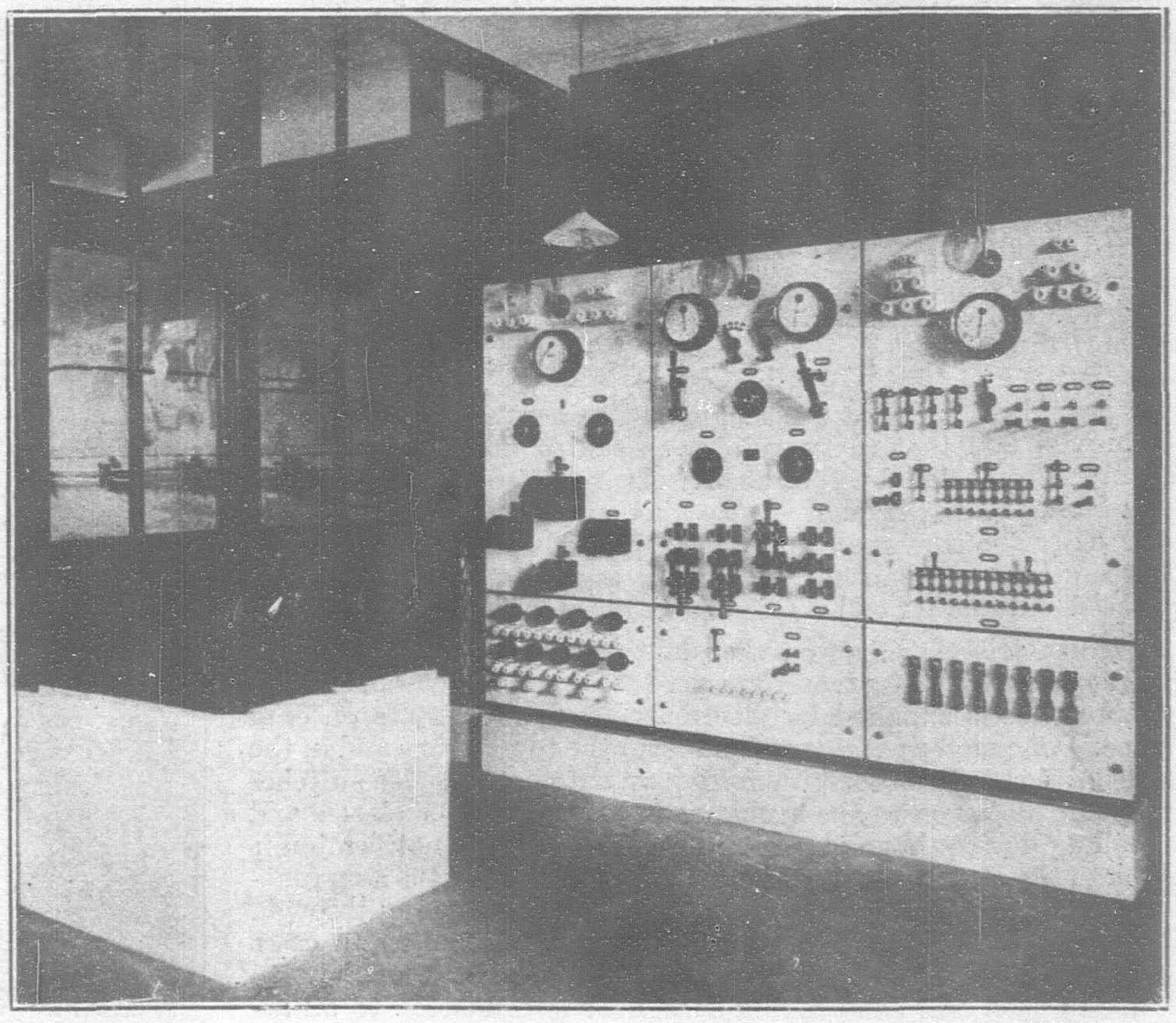
rods, the whole of each group being arranged in twenty-five groups of 20 telephones each. These brass rods are held rigid in a framework and these frameworks each containing twenty telephones are fitted fanwise on one side of an iron frame, which carries on its other side a series of brackets (50 of them) each of which supports a machine called a "Linefinder." This machine look in appearance like a metal plate with a few wheels and electros magnets on it, and laying across its diameter a long narrow flat bar. This plate is capable of a radial movement and bringing the end of the flat bar opposite to each of the groups of wires on the opposite side of the frame, the bar by moving forward makes connection with any particular wire in the group to which it is opposite.

How It Works

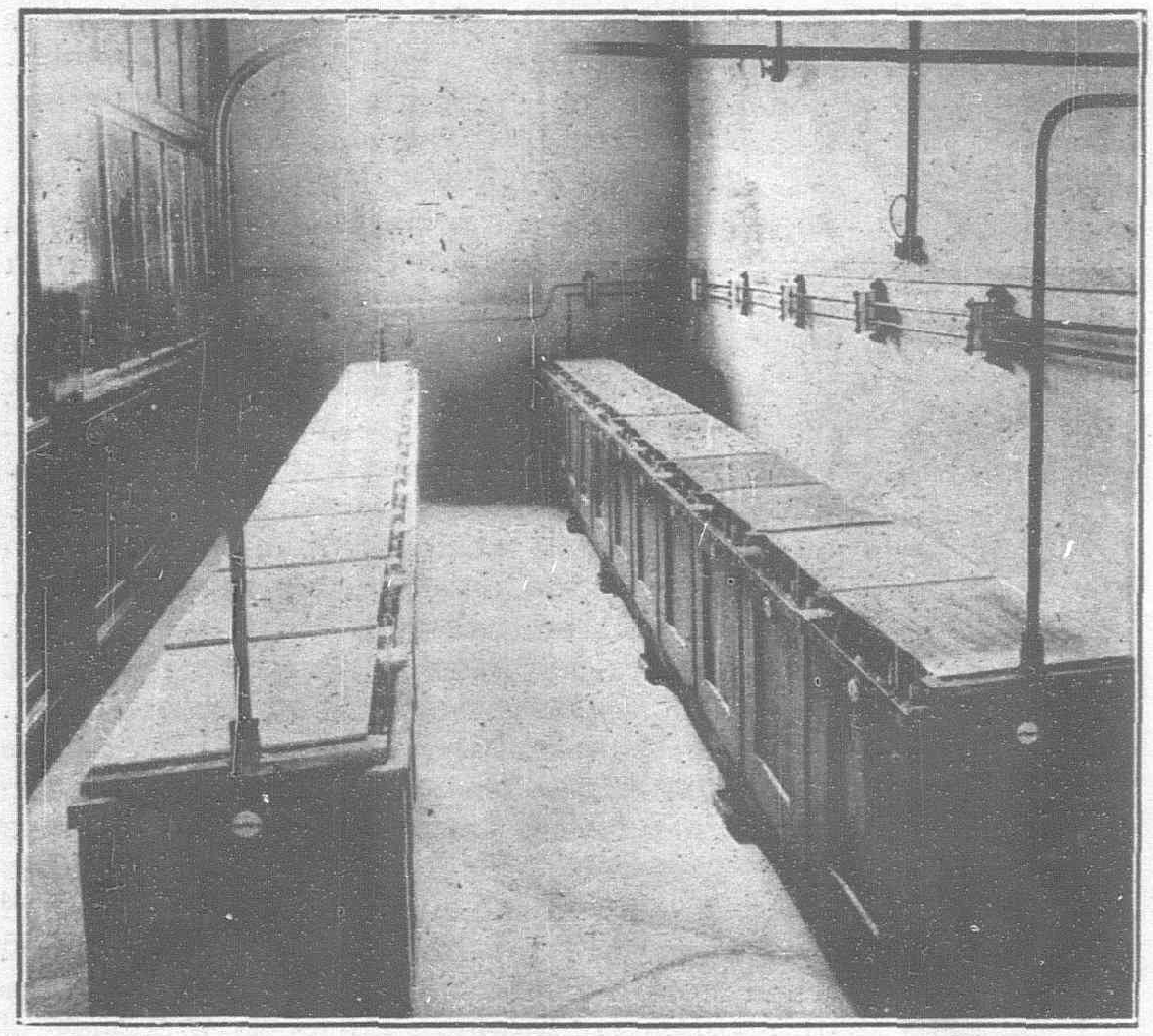
When a subscriber lifts his telephone off its cradle or support, a piece of mechanism called a "Starting Distributor" causes seven or eight of these "Linefinders" to start rotating before the frames containing the telephone wires until one of the "Linefinders" arrives opposite the particular group of 20 telephones in which the calling subscriber's line is situated. The rotation of all the "Linefinders" then ceases and the bar or plunger opposite the above-mentioned group immediately darts in amongst the wires and makes connection with the particular telephone line that wants the exchange.

This operation connects the calling subscriber to another piece of mechanism called a register, which is the mechanical equivalent of human operator at an ordinary manual exchange. As soon as this machine is ready to take the call, which is practically instantaneously (unless the exchange is very, very busy and all the registers are engaged) a signal is sent back to the subscriber, who has been waiting (about 2 or 3 seconds) with the receiver to his ear. This signal is a continuous buzz or tone and takes the place of the manual operators "Number Please." The subscriber then starts to "Dial" his call. An automatic telephone is just like an ordinary telephone but has an additional piece of apparatus called a "Calling Device" or "Dial." This consists essentially of two discs, one fixed which forms a mounting plate by which the apparatus can be screwed down, and the other movable and provided with ten finger holes, each hole being labelled 1 to 0. In setting up the number 50499 for instance the finger is put in the hole labelled "5" and the disc is drawn round in a clockwise direction until the finger meets a stop which is attached to the fixed disc. The finger is then released and the movable disc will return to its original position of its own volition, and in so doing five electrical impulses will be sent back to the exchange. After the deal has come to rest the finger is put in the hole opposite the "0" and again released. This time 10 impulses will be sent back to the exchange. After the disc returns again, the same procedure is carried on with the figures "4," "9" and "9." As the different impulses come through to the register, various pieces of mechanism are set in relative positions, and when certain combinations are completed as the different sets of impulses are received, a piece of mechanism known as a "Group Selector" picks out a disengaged piece of apparatus known as a "Connector" which has access to the particular group of lines in which the "Wanted" subscriber is situated. This connector is similar in appearance to the "Linefinder" and has 500 telephone lines in front of it. As the impulses come through from the two final digits of the number required, the register causes the connector to rotate before the 25 frames holding the telephone wires and stops it when it comes opposite to the particular group of 20 in which the wanted telephone line is placed and then the bar or plunger darts in amongst the wires, and the register causes it to stop on the required number.

The work of the register is now completed and the "Linefinder" in connection with the "Calling Subscriber" is now joined through to the "Connector" which is in connection with



Switch Board and Motors in the East Exchange of the Shanghai Mutual Telephone Company, Ltd.



The Exchange Storage Battery

General View of Automatic Telephone Exchange at Dairen

the "Wanted" subscriber. If the latter should be engaged a series of short buzzes or an "Interrupted tone" will be heard by the subscriber making the call and the receiver should be replaced on the rest. If on the other hand the line is disengaged an intermitted ringing current will be sent out to the wanted subscriber causing his bell to ring at short intervals until he answers. In order that the calling subscriber may know that he is through and that the people he is calling up are being rung, an intermittent signal will be heard in his receiver in the nature of a long buzz, then a period of silence, then another long buzz, and so on. After the conversation is over, the replacing of the receiver causes all the mechanism involved in setting up the call to be released and another call may be made immediately afterwards.

The whole of the automatic plant occupies five different rack or frameworks and the motive power for moving the various pieces of apparatus is supplied by electric motors in duplicate on each frame. One motor obtains current from the town mains and in the event of this source of supply failing an automatic device switches the other motor on to the exchange battery. Various alarms and signalling devices have also been provided whereby notification is given to the attendant, should any part of the apparatus stop functioning, or should there be undue delay in a call going through. Provision is also made for assisting people in difficulties in cases for instance where a subscriber cannot or does not know how to dial. In such cases the calling subscriber is connected to an attendant who can plug into his line and complete the call for him.

Humidity plays an important part in the successful working of the plant and steps have been taken to regulate the moisture in the air automatically. When the humidity present reaches a certain percentage, electric heaters and fans are instantly set working and when the air is again at its correct degree of dryness the heaters and fans automatically stop.

The installation at the Shanghai east esxchange is supplied by Messrs. L. M. Ericsson & Company of Stockholm, and is the first system of its kind to be placed in operation outside of Europe.

Plans for Tokyo

Taking advantage of the destruction of old style telephone equipment in the earthquake, the Tokyo telephone bureau has announced that all of the telephone central offices destroyed in the September disaster will be replaced with automatic telephone equipment, says the *Japan Advertiesr*.

The present plans for restoration of the telephone system will not be completed until 1925.

"As a result of the September earthquake, 16 out of 20 telephone central offices in the city were destroyed, causing damage estimated at Y.150,000,000, Mr. Shimmyo said. "Many improvements must be made in the Tokyo telephone system, but the first and most important step the bureau has decided to adopt is an automatic telephone system for the new telephone central offices, some of which are already under construction.

"This system will eliminate considerable waste of labor for the bureau because numbers are obtained by shifting numerical figures on a dial attached to the telephone.

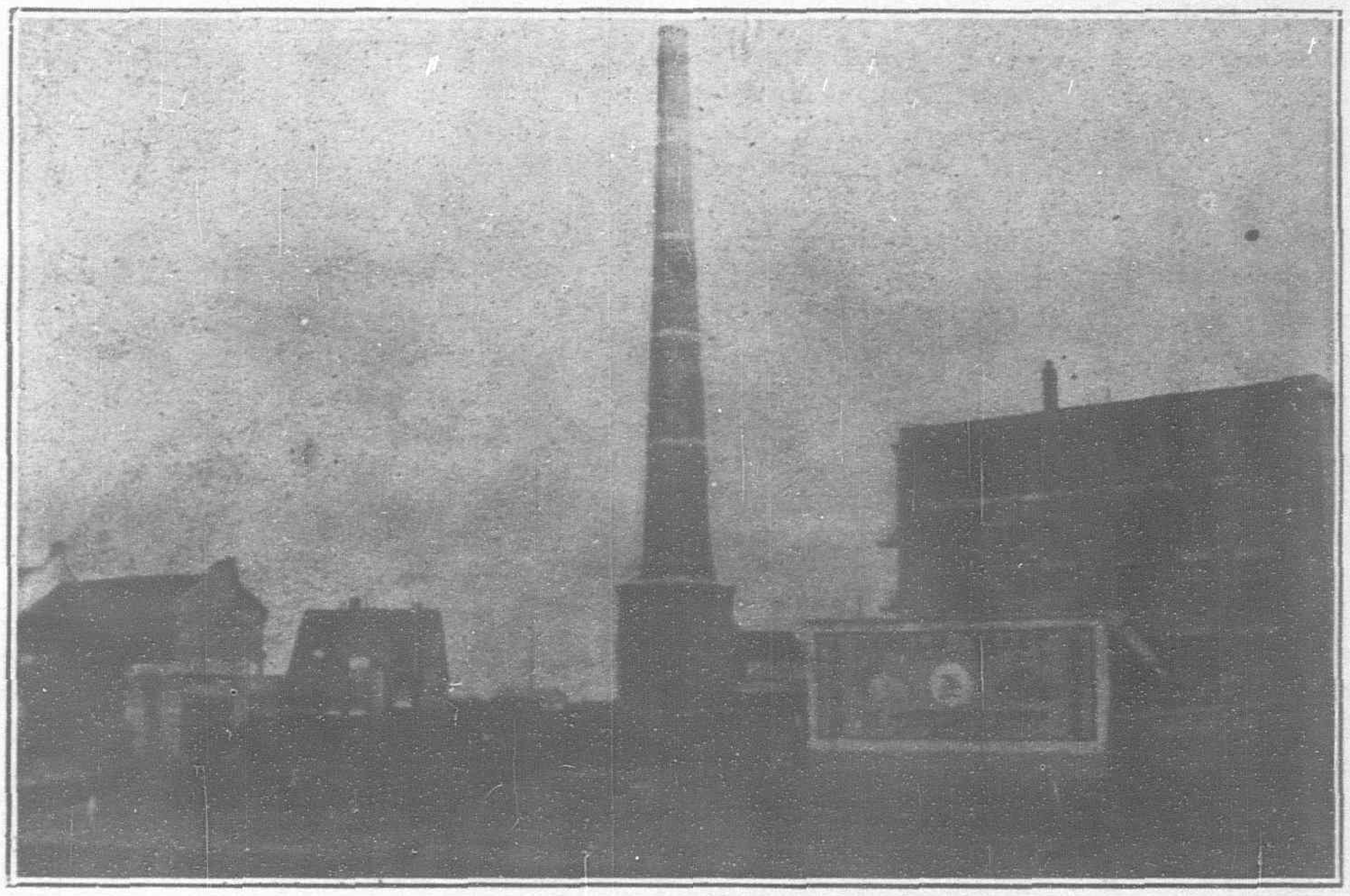
"Work of constructing six telephone central offices on the former sites where no land readjustment is necessary is under way and they are expected to be completed by September. The construction of the rest of the telephone centres will take place pending the completion of the land readjustment, and it is expected to be finished

(Continued on page 192)

One of the Tokyo Exchanges destroyed by Fire

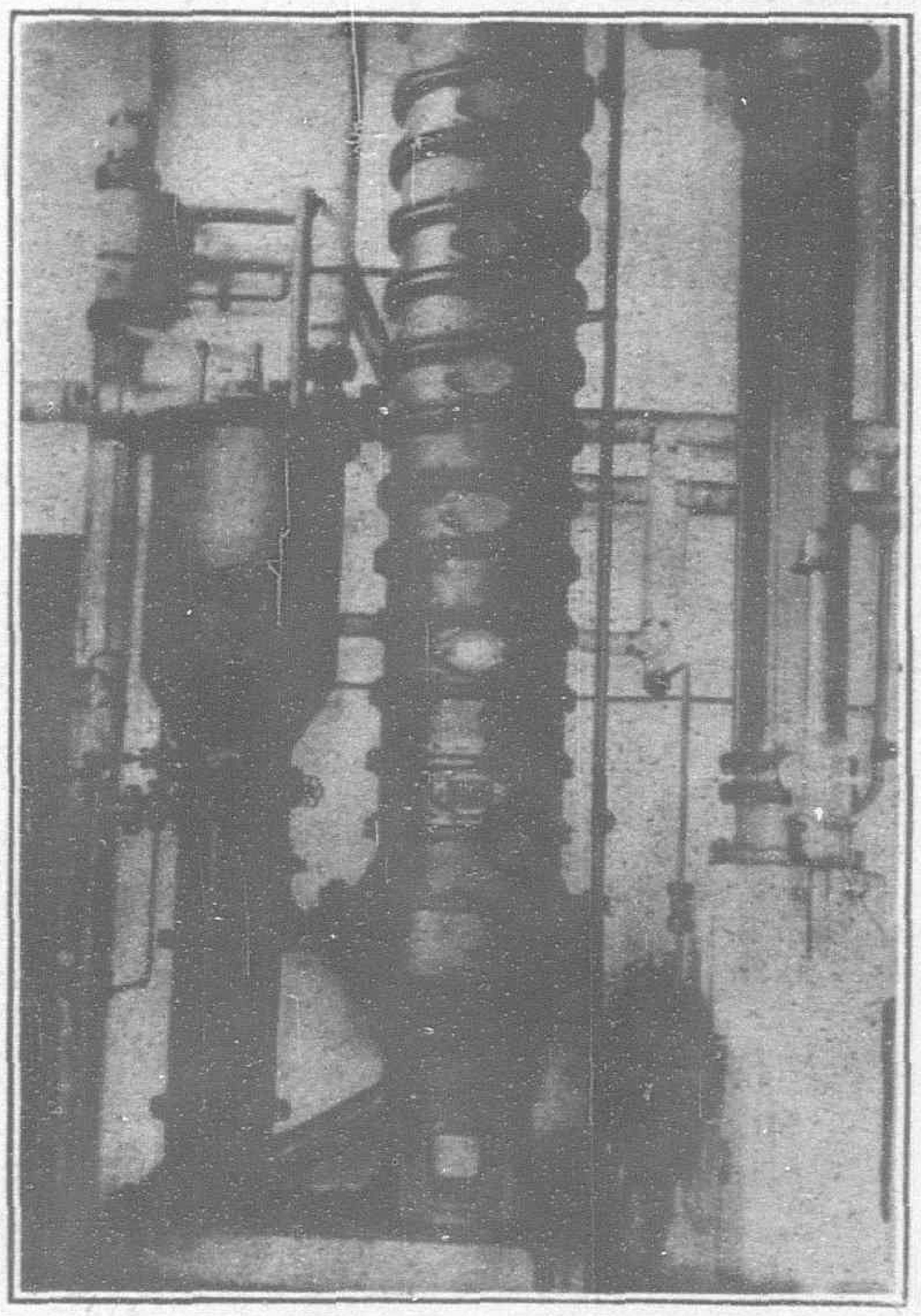
Compressed Yeast Plant in Shanghai

A PLANT for the manufacture on a commercial scale has just been completed in Shanghai, on the borders of the settlement, capable of producing 1,500 kilograms a day of yeast. The plant, situated on the Soochow creek, opposite the Warren piece, is the only one of its kind in the Far East and its product is already being sold as far south as Singapore and as far north as Harbin. Cold storage facilities have been built into the plant to allow the manufacture and preservation of the yeast during the summer months.



General view of the Asiatic Yeast Works

The plant is operated by the Asiatic Yeast Works, a filiale of the German Mee-Yee Trading Company of Shanghai. The machinery is all imported from Germany except certain simpler pieces which it has been found possible to turn out in China at lower cost. A steam-engine capable of developing 35 horse-power provides the necessary power and the two larger vats have a capacity of 50,000 and 35,000 liters respectively. The plant has its own electric light, also their own artesian-well, 304-ft. deep, from which a tested capacity of 20,000 gallons an hour can be pumped. The water is free from bacilli and has a temperature of 19 degrees centigrade.



Machine for distillation of pure raw alcohol from waste liquid from the yeast solution

The plant has a large boiler for the production of steam and heat. The building is four stories high, and 45 workmen are regularly employed, the majority being skilled men in various branches of the yeast-making process. The plant is in charge of a German chemist and bacteriologist, Mr. Hamann, who has superintended the construction and operation of similar plants in several countries of Europe.

Barley for the production of the yeast is first soaked in a tank of water until soft and thereafter laid out on the concrete floor of the maltery to grow from ten to twelve days, the temperature being very carefully watched, because when too low the barley stops growing, when rising too high the barley grows too fast. The maltery is maintained at an even temperature throughout the year by the use of an ammonia cooling system.

From the maltery the barley is taken and crushed between two heavy steel rolls until it consists of flat flakes much like Quaker oats. It is then dumped into the large oak-wood tank and mixed with water, making a malt solution.

In the meantime a special convertor has been cooking Indian corn to a thick paste, which is blown out of the convertor by steam at a pressure of 50 pounds into the oak tank with the malt solution. The diastase of the malt now changes the starch of the corn into sugar. When the solution has been sugarized, it is then fermented by the introduction of milk-acid bacteria into the same tank. After a certain acid percentage has been reached, the milk-acid germs are killed by raising the temperature of the solution to a certain point.

The solution is now pumped into another large tank for filtration. This tank has a special bronze bottom of very fine sieves, which hold back the solid matter remaining from the barley not in solution. This residue is then thoroughly washed out with hot water, and sold for foodstuffs for cattle.

The extract, in the meantime, runs into a big fermentation tank, where the yeast culture is introduced. The solution stands twelve hours. In order to stimulate the growth of the yeast, air is introduced through needle sprays and as it passes in bubbles to the top of the tank, gives the yeast cells the oxygen they need for rapid work. An even temperature is maintained the whole while by means of cold water coils in the tank, taking off the heat caused by the action of the yeast.

The fluid is now drawn off through a pipe, and after going through one more sieve control, falls into the centrifugal separators, of which there are four. These throw out the thick yeast and discard the liquid. The yeast now passes through another pipe to a press, composed of plates in parallel, capable of holding 200 kilograms of yeast at once. The plates squeeze out the last liquid and drop the compressed yeast, now dry, into special containers. The liquid is diverted back to a large tank from where it is distilled, producing a pure raw alcohol.

The yeast from the press is put into shaping and cutting machines, and formed into cakes and packages ready for sale or storage.

The room in which the final processes of separating, pressing, cutting and wrapping are done, is specially protected from the outside temperature. The floors are eight inches thick with cork and the outside walls have a layer of four inches of cork. The temperature of the room will be constant at 15 degrees centigrade throughout the year. A large system of overhead ammonia coolers is now in operation for this purpose.

A special laboratory equipped with the latest microscopes and other apparatus for the examination of cell life is on the second floor. Here the individual yeast cell best fitted for the reproduction of healthy strong cells is picked out by means of microscope and slide, from thousands of its fellows. Having been thus selected, it is put into an incubator and its progeny are put into culture apparatus and increase in quantity until sufficient cells have been produced for use in the big vat.

Chinese Wood Oil[*]

Production, Properties and Uses

By "Omega"

CHINESE wood or tung oil is obtained by crushing the seeds of *Aleurites cordata* or *Elaeococca vernicia.* At Fokien the seeds of *Aleurites Dordii* (Heussh) are used, the oil obtained from these seeds differing but slightly from that obtained from *Aleurites cordata* (see Kamelaka, *J. Coll. Science Imp. Univ. Tokyo*, 1908, and Lewkowitsch, Vol. 2, 0. 82). The tree is widely distributed throughout South, Central, and West China, in Indo-China, Tonkin, Cambodja, and Annam. The seed is one of the most important native products of China, and the oil forms the second largest in quantity of all commodities exported from Hankow.

The best quality oil is produced in the Chinese provinces of Szechuan, Kweichow, Huanan, and Hupei, the U.S. department of commerce report from the consul-general at Hankow stating that 30 per cent. of the total oil exported is manufactured in Szechuan 50 per cent. in Huanan and Kweichow, and 20 per cent. at Hupei. The oil content of methods now in use only about 40 per cent. is recovered. The agricultural and forestry boards of the south-western states of America have attempted to cultivate the Chinese wood tree in California under semi-arid conditions, but up to date the quality of the oil obtained has not equalled the Chinese variety. Some progress has been made with the pressing of the Chinese wood seeds at Madagascar, where the oil is known as "bakoby oil."

Methods of Production

Chinese wood oil is marketed in various qualities, varying in color from light yellow to dark brown, and usually graded according to color, the district of production, and the methods used in expressing. The quality of the oil is largely dependent on the botanical and geographical origin of the seed, climatic conditions, conditions of storage, and the general treatment of the oil during its production. It often appears commercially under the name of wood oil, and hence the confusion with gurjum balsam, also known commercially as wood oil. The major portion of the oil produced is expressed by crude native methods in the interior, and shipped to Hankow. The seeds are dried over open fires, and then coarsely ground between mill-stones driven by oxen. The oil is extracted by pressing in crude wooden presses. The high-grade white Chinese wood oil is obtained by cold expression; the darker and cheaper varieties are obtained by further pressing the heated seeds. The cold-pressed oil is known in some markets as white tung oil, and the hot-pressed as black tung oil.

The residual seed-cake is not suitable for cattle-feeding purposes, but is used as a fuel and as a fertiliser. The production of the oil appears to be distributed over a large number of small individual makers, usually consisting of families, who bring the oil into the large towns, where it is bought by foreign merchants, who clarify the oil by settling before shipping. Apart from a process of sedimentation and filtration, but little refining of the oil is conducted.

American Specification for the Crude Oil

The standard specifications for raw Chinese wood oil adopted by the U. S. paint manufacturer's association is as follows:—Raw tung oil shall answer to the following requirements: Sp. gr., 15.5° C., 0.943—0.939; acid value, 6 (max.) saponif. value, 195—190; unsaponif. matter, 0.75 per cent. (max.); $n_D{}^{25} = 1.520—1.515$; iodine value (Hübl 8 hours), 165 (min.); and heating test, 12 mins. (max.). The following modification of Browne's heating test is prescribed: Test tubes for the oil should be 15cm. by 16 mm., and be closed by a cork through which a glass rod 3 mm. in diameter can move easily. A beaker (800 cc.), 15 cm. high and 10 cm. in diameter, is filled to 7.5 cm. with cottonseed or soya bean oil, and in this is suspended a thermometer at 1.5 cm. from the bottom. The oil is heated, and at 293° C. (560° F.) two test-tubes containing respectively 5 cc. of the tung oil and 5 cc. of a control sample are introduced, so that the bottom of each tube is level with the lowest part of the thermometer bulb. The source of heat is removed for about 45 secs. and then replaced, and the temperature maintained at 282° C. (540° F.) as constantly as possible. After 9 mins. the glass rods are raised at intervals of $\frac{1}{4}$ min., and a note taken of time required for each sample to set firmly. The average time of setting of pure American pressed tung oil was $9\frac{1}{2}$ mins., whilst the same oil with 5 per cent. of soya bean oil required $10\frac{3}{8}$ mins. to set.

Properties of Chinese Wood Oil

Chinese wood oil is a pale yellow to brown oil, of a pronounced and persistent odor, high dispersion value, and dries more rapidly than any other fatty oil (*Pharm.* Jour./3, xv., p. 637). With the exception of castor oil, with which it is not easily confused, Chinese wood oil has the highest specific gravity and refractive index of the fatty oils. Its characteristic odor appears to develop on storage, newly pressed oil possessing a highly pleasant odor. The constants of the oil are as follows:

Specific gravity at 15° C.	0.9360—0.9440
Solidifying point	2° —3° C.
Saponification value	189° —196° C.
Iodine value	150 —170
Heat of bromination	24° —25.5° C.
Refractive index at 20° C.	1.5110—1.5210
Butyro refractometer value at 40° C.	72.5°
Valenta value (acetic)	38.3°
,, ,, (true)	46.5°
Dispersion power at 40° C.	0.0371
Acid value	7.6 —12.0
Optical activity	Inactive
Viscosity at 15.5° C.	1850 seconds
CONSTANTS OF FATTY ACIDS.	
Solidifying point	31.2° C.
Titre test	37.1° C.
Melting point	40° —44° C.
Neutralisation value	189
Iodine value	145 —160

Gelatinisation and the Effects of Heating

On continued storage Chinese wood oil becomes gelatinised. Morrell (*J.C.S.*, 1912, p. 2,083) found that twelve months' storage converted 6 per cent. of the oil into a crystalline isomeride. It has been found by various observers that solvent-extracted oil does not polymerise as easily as expressed oil. The property of Chinese wood oil of coagulation on heating has been the subject of considerable investigation, and various patents have been granted for introducing catalytic agents to raise the temperature of coagulation. Beringer (*Ger. Pat.* No. 261,403, 1912) suggests the addition of sulphides or selenides. Weinschenk (*Ger. Pat.* No. 253,845) introduces 1 part in 10,000 of zinc dust at 90° C. Traces of iodine sulphur chloride, or dimethyl sulphate have been found to promote gelatinisation. The coagulation of Chinese wood oil on heating limits its use in several industries.

The effect on the properties of Chinese wood oil on heating have been studied by Morrell (*J.S.C.I.*, 1915, p. 1907), with the following results:—

	Raw Oil.	Thickened Oil.
Specific gravity at 15° C.	0.9405	0.9561
Refractive index	1.5172	1.5134
Molecular weight in benzine	797	1431
Acidity	3.3	2.3
Saponification value	192/194	190/201
Iodine value	165/168	143/171
Glyceryl (per cent.)	10.47	8.3

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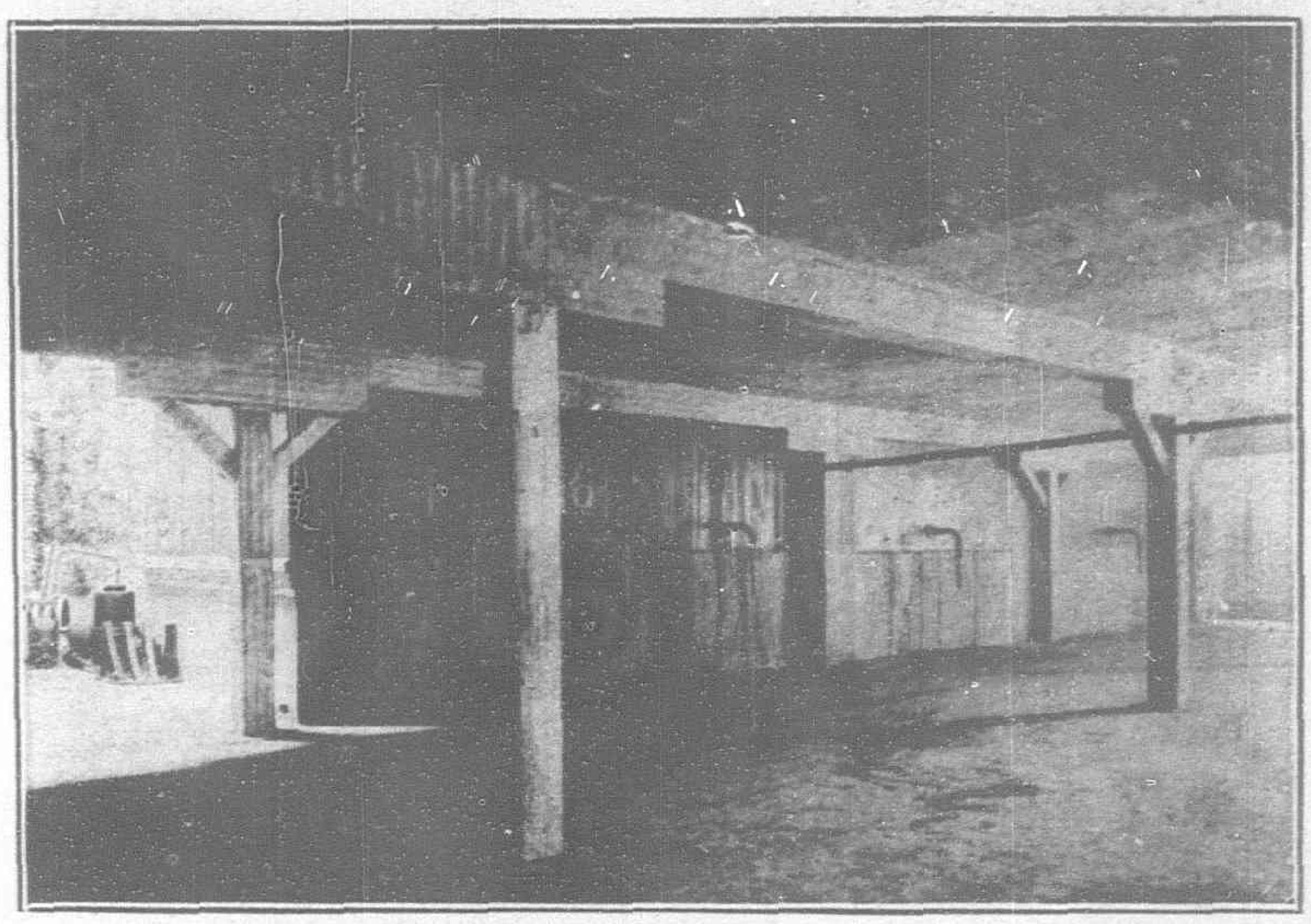
[*] The "Chemical Trade Journal and Chemical Engineer."

ONE OF THE LARGEST WOOD OIL INSTALLATIONS IN CHINA

JARDINE, MATHESON & COMPANY'S PLANT AT HANKOW

One of the Oil Storage Tanks.



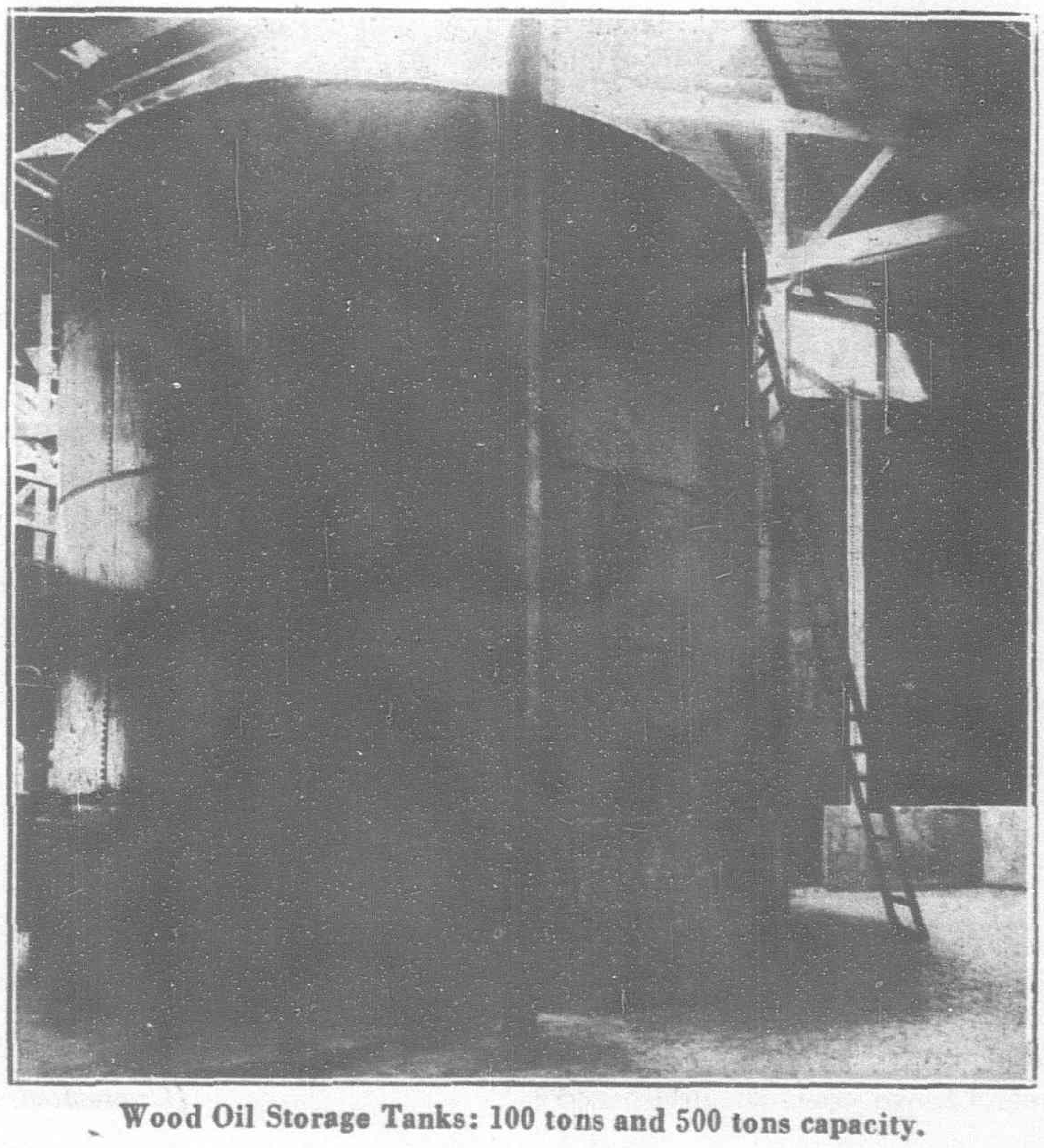
Front of Steaming Tanks: 100 tons capacity.

The gelatinous mass produced on heating the oil is not a homogeneous product, only a small proportion of the oil being changed. The unchanged oil can be extracted by solvents. Wolff (*Farden. Zeit.*, 1913, Vol. 18, p. 1170/1174) states that the jelly mass forms a colloidal solution with the unchanged oil, the setting of the mass being brought about by the gelatinisation of the whole. A small quantity of the stiff mass has been found capable of gelatinising large quantities of hot oil very quickly. Stevens and Armitage, Irvington, N. J., U.S.A., have recently published a most extensive bibliography of the technical and patent matter connected with Chinese wood oil, some 800 publications, together with 200 patents, being mentioned.

Composition of Chinese Wood Oil

The principal components of Chinese wood oil are the glycerides of elaeomargaric, and, to a lesser extent, oleic acid. The former is a stereo-isomeride of linolic acid. This mixture of glycerides appears to be a medium peculiarly suitable for the promotion of rancidity, and rancidity when once initiated proceeds rapidly up to about 6 per cent. free fatty acids. Chinese wood oil contains practically no saturated glycerides. Divers (*J.S.C.I.*, 1913, p. 23) found that the Chinese wood oil seed contains a cyanogenetic glucoside and an enzyme which lose their acivity on heating.

The characteristic coagulating properties of the oil have been studied by Fahrion (*Chem. Zeit.*, 1912, Vol. 2, 2,153/2,157), who found that the coagulation took place in two ways—(1) by molecular transformation, (2) by mesomorphous polymerisation. The glycerides and the fatty acids contained in Chinese wood oil are easily acted upon by light, with the production of isomeric compounds of higher melting point (Bauer, *Chem. Umschau*, 1922, Vol. 29, p. 229/232). Morrell states that prior to polymerisation there is a transferring of the linkages in the molecule and some slight evidence of ring formation. Fokin (*Jour. Russ. Phys. Chem. Soc.*, 1913, Vol. 45, 0. 283/285) explains the increased refraction and transformation of the elæomargaric acid by actinic rays into a higher melting-point product by assuming the presence of either conjugated double likages or, as in allene, a double-linked carbon atom. Marcussion (*Zeit. Oel u. Fett. Ind.*, 1923, Vol. 43, p. 163/164) found that on ether extracting gelatinised Chinese wood oil 88 per cent. was soluble in acetone and 12 per cent. insoluble.



Wood Oil Storage Tanks: 100 tons and 500 tons capacity.

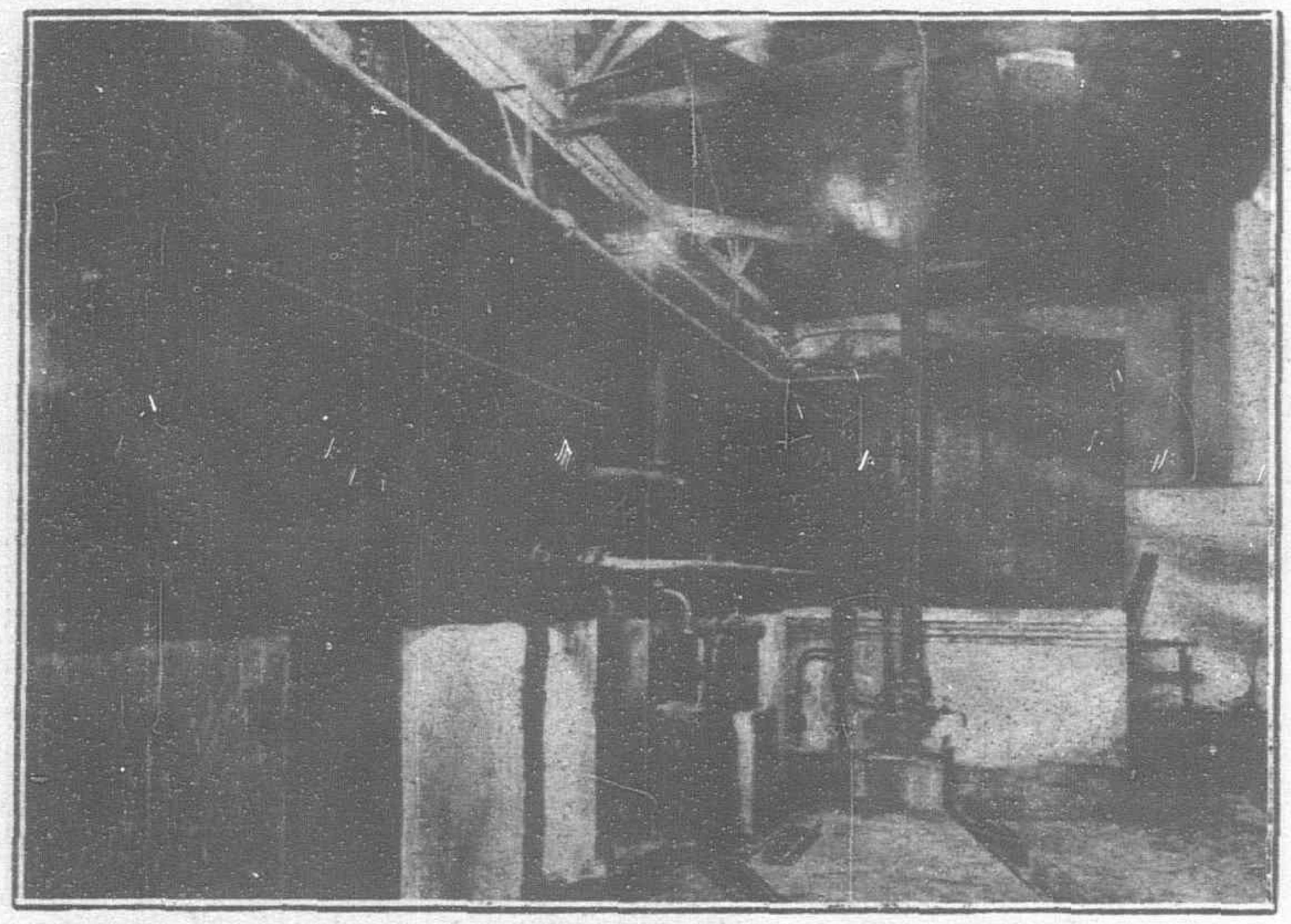
Growth and Extent of the Industry

Statistics regarding the extent of the Chinese wood oil industry are not available for England, as the board of trade returns include Chinese wood oil under the item "Various Vegetable Oils." The U.S. commerce report for February 9, 1921, p. 815, states that considerable quantities of the oil are used within China for "caulking" boats, and as a wood varnish and preservative. The total amount and value of the oil exported from the whole of China to foreign countries for the years 1912 to 1919 are as follows:

	Weight in Tons.	Value in Dollars.
1912 ..	34,691	4,309,174
1913 ..	37,598	2,967,111
1914 ..	26,164	2,509,297
1915 ..	18,473	1,843,554
1916 ..	35,665	4,565,108
1917 ..	23,898	4,932,626
1918 ..	29,598	7,129,280
1919 ..	36,516	10,816,955

Under war conditions the demand for Chinese wood oil increased to an enormous extent. Shipments for 1922 were the largest on record, amounting to a value of 10,888,130 Haikwan taels, compared with 5,466,430 in 1921. The market price of the oil appears to determine to a considerable extent the amount produced and imported in any season. The following were the market prices (dollars per picul—133⅓-lb.) at various periods:—

January,	1910 ..	5.33
,,	1911 ..	9.30
,,	1910 ..	18.58
October,	1920 ..	15.48
April,	1923 ..	17.30
January,	1924 ..	23.00



Back of Steaming Tanks: Duplex Pumps for filling Storage Tanks.

Rivetting and Flaring Hoops: Driving Hoops on Casks.

The American consul at Hankow states, in his report for 1921, that large quantities of Chinese wood oil are held for speculation purposes by dealers in the interior Chinese markets, and that over 60 per cent. of the exported oil from Hankow comes from the Szechuan or Kweichow district, the oil having to be brought in junks through the treacherous Yangtze gorges. Prohibitive insurance rates exist for bringing cargoes of Chinese wood oil from Szechuan to Hankow.

Adulteration and Identification of Chinese Wood Oil

The high prices ruling of late years have occasionally tended to introduce adulterants or diluents into the genuine oil. The common oils found as adulterants are soya, cotton-seed, sesame, and stillingia. The highly characteristic odour, specific gravity and refractive index of Chinese wood oil make adulteration only possible up to a limited amount. Lewkowitsch (Vol. 2, p. 79) states that sesame oil is detected by the Baudouin test, and stillingia oil by the optical activity. However, the most important tests to be applied to a suspected sample of Chinese wood oil are the gelatinisation test, specific gravity, refractive index, dispersion value, iodine value, and the viscosity. Chapman (*Analyst*, 1912, Vol. 37, p. 543/549) examined 17 samples of the oil obtained from Hankow (and known to be genuine), with the following results :—

	Sp. Gr. 15/15° C.	Iodine Value (Wij's).	Sap. Value.	Refrac. Index at 20° C.	Viscosity.
Minimum ..	0.9406	166.4	192.0	1.5170	1636
Maximum ..	0.9440	176.2	196.6	1.5207	2178
Average ..	0.9425	170.6	194.2	1.5179	1850

McIlhiney proposes a method for the determination of the amount of Chinese wood oil in mixtures by gelatinising the former with iodine in chloroform or acetic acid, and separating the insoluble matter with petroleum. Schumann (*Proc. Amer. Soc. for Testing Materials*, 1914) proposes to estimate adulterants such as sesame and soya oil by gelatinising the oil with a trace of sulphur chloride aided by the action of light, an isomeric glyceride being formed which is insoluble in petroleum ether. The U. S. *Commerce Reports* of February 9, 1921, p. 813, states that merchants avoid some adulteration by applying so-called "secret" tests to determine the purity of the oil. Drying tests easily differentiate Chinese wood oil from linseed oil, the former drying much more rapidly giving an opaque no-elastic film, in contrast with the transparent elastic linseed film. Boughton gives the following results of drying tests of the two oils in the presence of litharge :—

	Hours Exposed.	Increase in Weight. Per Cent.
Chinese wood oil	48	0.9—5.9
,, ,, ...	96	3.6—8.7
Linseed oil	48	12.9
,, ...	96	13.7

Tests Adopted by the New York Produce Exchange

Krumbhaar (*Chem. Zeit.*, 1916, Vol. 40, 0. 937/939) considers that the most marked difference between Chinse wood oil and linseed oil is the rate of polymerisation. The chemists of the New York produce exchange detect any adulteration by applying a stringent gelatinisation test, more importance being attached to the hardness of the gelatinisation product than to the time of gelatinisation. The oil is required to satisfy either of the following tests :—

Bacon's Test.—In four test tubes of ¾-in. by 4-in. are placed : (1) 10 cc. of pure Chinese wood oil ; (2) 10 cc. of the same oil containing 5 per cent. of a vegetable oil ; (3) 10 cc. of the Chinese wood oil containing 10 per cent. ; (4) 10 cc. of the sample to be tested. The four tubes are immersed in an oil bath at 288° C. The tubes are maintained at a temperature of 280—285° C. for 9-mins., withdrawn, and the contents compared. Each tube is stabbed throughout with a small bright spatula. Pure oil gives a hard clean cut, and when the spatula is withdrawn the incision looks like a straight line ; while an adulterated oil will invariably be softer and the incision will have a peculiar feathered effect. An adulteration exceeding 12 per cent. will cause the oil to remain entirely liquid.

Worstall's Test.—100 grms. of the oil are heated in an open metal pan, 6-in. in diameter, over the course of 4 mins. The oil is kept at 540° C., and stirred until it commences to solidify, which should not exceed 7½ mins. for pure oil. When the oil has solidified in the pan, it is turned out while still hot and cut with a knife. Pure oil gives a product that is pale, firm, and cuts under the knife like dry bread, not sticking. If the oil requires more than 7½ mins. after reaching 540° F. until starting to solidify, or if the product is dark, soft, or sticky, the oil should be rejected.

The high dispersion power of the oil is one of its characteristic properties, the dispersion power for typical vegetable oils being as follows : Chinese wood oil, 0.0371 ; linseed oil, 0.0218 ; cottonseed oil, 0.0195 ; castor oil, 0.0190 ; and coconut oil, 0.0167.

Applications of Chinese Wood Oil

Chinese wood oil is used principally as a wood varnish, for the "caulking" of boats, as a waterproofing agent, lacquer component and as a substitute for linseed oil in varnish, linoleum, and paint manufacture. It is also used to some extent in the soap industry, as an illuminant, in Chinese-ink manufacture, and in medicine as an emetic and purgative. The oil finds extensive application in China for preserving the wood of the boats on the inland waterways, and as a waterproofing agent for cloth, silk, and leather, producing articles which are highly efficient substitutes for india-rubber products. The fatty acids of Chinese wood oil are used in the production of spirit lacquers, as a dressing for leather, and for the waterproofing of paper. In the production of *papier mache*—which is a baking operation—the process is not a polymerisation of the oil, but an auto-oxidation. Chinese wood oil has been patented as a substitute for kauri gum in linoleum manufacture, and the gelatinised oil enters into the composition of a large number of commercial products. Steinitzer (*Ger. Pat.*, No. 200,746) has patented a loading material for rubber, made by treating Chinese wood oil with sulphuric acid of 1.688 density. Baekeland (*U. S. Pat.*, No. 1,312,093) has patented a process of veneering metallic

(Continued on page 174)

Ramie or China Grass

By J. Frank Gillen, Far Eastern Division, Bureau of Foreign and Domestic Commerce
In Collaboration with J. Orlo Hayes, Stanford University

Introduction

THE diminishing supply of certain staple commercial fibers, as indicated by an increasing interest on the part of American manufacturers in some of the rarer fibers, has prompted the publication of this bulletin on ramie or China grass.

Although this fiber has been used for centuries by the Chinese in manufacturing cloth, it is only in recent years that its possibilities as a substitute for other vegetable fibers have been realized by foreign countries. In addition to its many textile uses, ramie grass is employed in the manufacture of cordage, nets, gas mantles, and like articles, and attempts to manufacture paper from it have met with success. While this fiber has not yet been industrialized and is now consumed largely in local markets, during the past four years China's exports of ramie have amounted to about $3,000,000 annually.

Credit is due Mr. J. Orlo Hayes, of Stanford University, for the greater portion of the material herein incorporated—the results of an extensive personal investigation of the ramie fiber in China. This has been supplemented by information gathered from the bureau's own sources and from the somewhat meager and incomplete published reports on the subject.—JULIUS KLEIN, *Director*.

Sorting China grass on the top floor of Jardine, Matheson & Company's produce godown at Hankow

Ramie or China grass, one of the strongest and finest fibers known, is widely cultivated in China, especially in the Yangtze valley provinces. The Chinese name for the ramie plant is hsien-ma, while it is known botanically as *Bœhmeria nivea*. Ramie itself is a non-stinging thistle-like perennial plant belonging to the nettle family. The stems of this plant attain a height of from 3 to 8-ft. and last for a period of five to seven years.

Under average conditions, which require a good, equally distributed rainfall, the stems are harvested three times a year and produce one of the strongest and finest of vegetable fibers. Ramie is extremely durable and has a brilliant silky luster, containing properties that can readily be dyed. It also has the additional advantage of being in its nature more like wool than other plant fibers, and because of its exceptional length, varying from 2½ to 18-in., it can be used as a substitute for long-stapled wool. It can be spun as fine as flax, is stronger, and has a more silky luster. When properly begummed, the relative strength of ramie appears as 100 units compared with hemp at 36; flax, 25; silk, 13; and coton, 12 units.

History and Uses of China Grass

Ramie grass was the principal substance from which the Chinese made their cloth before the introduction of cotton in the country as an important textile material, which was probably about the year 1300. Subsequently, ramie grass gradually became less important, since with the opening of China to foreign trade and the introduction of muslin and linen it was further replaced by these imported articles.

It is only within the last few years that ramie grass has been utilized to any great extent by foreign countries. Experimentation as to the utility of this fiber has led to an increased foreign demand. In addition to its use for textile purposes, which is again important, ramie grass is also employed in China in the manufacture of mosquito and fishing nets, twine, cordage, etc., which are largely exported to Siam and the Straits Settlements. Foreign countries employ it in the manufacture of gas mantles, ropes, lines, nets, underwear, canvas, and similar fabrics. Recent experiments have also proved that ramie grass can be utilized in the manufacture of paper. Large quantities are annually exported to Japan, where it is prepared to resemble silk thread, from which imitation silk garments are produced.

PRODUCTION.

Probably every province in China grows some ramie grass, but the principal ramie-producing provinces are Hunan, Hupeh, Kiangsi, and Szechuan. The best grass is raised in the Hunan and Hupeh provinces. Next to these provinces may be mentioned Kwangtung and Fukien, and then perhaps Shensi. Shansi is said to be also a ramie-producing province, but the conditions of the production there are little known. The following figures, taken from the customs returns, give some idea of the relative importance of the different parts of China in the production of ramie:—

EXPORTS OF RAMIE, BY PORTS, 1917-1921.

(1 picul=133⅓ pounds.)

Ports.	*1917*	*1918*	*1919*	*1920*	*1921*
—	—	—	—	—	—
	Piculs.	*Piculs.*	*Piculs.*	*Piculs.*	*Piculs.*
Changsha	—	39	—	—	—
Yochow	40,480	57,070	37,428	59,590	50,791
Hankow	182,704	179,473	168,167	157,769	138,719
Kiukiang	163,455	167,989	140,280	156,520	146,524
Nanking	10	—	—	—	—
Chinkiang	—	8	—	—	78
Shanghai	116	102	521	340	358
Ningpo	15	173	239	83	—
Foochow	—	9	11	—	3
Swatow	—	88	39	94	27
Canton	12	612	—	6	—
Wuhu..	—	—	—	—	74

From the above figures it will appear that Hankow and Kiukiang are the two most important exporting centres of ramie. Ramie is also extensively cultivated on the hilly plateaus north of Kityang, Kwangtung, about 30 miles from Swatow. Kityang is famous for its grass cloth, which is made from locally produced ramie or that produced in the southern part of Fukien, as well as a large quantity imported from the Yangtze ports, chiefly Hankow. Ramie is also produced in considerable quantities in the western part of Kwangtung.

It is generally recognized that of the three chief ramie products sold on the largest market (Hankow) yuen-kiang grass is the best. It is of a greyish yellow color with a slight tinge of maroon, has the stiffest fiber, and looks the best after a slight dressing. The Wuchang product is whiter, softer, and finer than the Puchi ramie, which is the coarsest of the three grades.

Fukien, like Kwangtung, is better known as a producer of grass cloth than a producer of ramie. Both provinces import a large quantity annually from the Yangtze ports and, in return, export grass cloth, chiefly through Swatow. The area over which ramie grass can be raised is very large. In short, ramie is found in all the warmer parts of China, or could be grown in them up to altitudes of 4,000-ft.

Cultivation of the Plant

The plant requires a hot, moist, equitable climate and rich, damp soil. It is chiefly found in districts having 35 or more inches of rainfall annually, where the soil and character of the land are such that no water stands on the surface.

China grass can be grown in the southern part of the United States, but, due to the high labor cost and the necessity of a great amount of hard labor, it is not profitable.

With most Chinese farmers China grass is strictly a minor crop, and as a result is produced only in very small areas. It is usually grown in glens or other sheltered places, such as inside city or garden walls, where no wind reaches it. No patches are found far away from farmhouses, as the plants require large quantities of fertilizer in the form of manure and also constant care and watching. The patches must, of necessity, be small on account of the limited supply of manure, since big patches would require large amounts of manure, which must be transported by hand. The absence of roads and pack animals in the growing districts makes any kind of transportation, except that by hand, practically impossible.

The average ramie patch consists of from 1 to 4 per cent. of the total area held by the ramie farmer. However, this percentage varies greatly, due to the frequent changing of landholders. This percentage makes the patch from one-twelfth to one-sixth acre each. In some exceptionally large patches, where the farmer's principal interest is the cultivation of ramie, the area may be as large as 1 acre. These large patches are usually found in hilly places, where other crops are difficult to raise.

METHODS OF CULTURE.

Propagation may be by seeds, cuttings, or division of the roots. Of these methods the planting by root division is the one generally used by the native Chinese farmers. The best ground for the ramie plantation is said to be the slope of a mountain where it is warm and dry and where water will not remain. Before planting, the ground is thoroughly plowed, after which fertilizers are added. Then holes from 2 to 4-ft. apart are dug, in each of which are buried three or four pieces of root, about 4 or 5-in. long. The depth of the planting is usually 3-in., with at least 1-in. of soil above the buds. The planting may be done either in the spring or in the autumn. Once planted, the ramie will be kept for five to seven years, and sometimes even longer. In the first and second years no crop is gathered and the stems are cut off early to secure a multiplication of stalks.

In the fall, before the arrival of severe frosts, the plant must be covered with a layer of cow manure to prevent freezing, as well as to fertilize the ground. This layer of manure stimulates the growth of weeds, which come up very rapidly. They are allowed to grow a few inches before being cut. Immediately after they are cut the manure is covered with a thin layer of clay to prevent leaching.

The young shoots start growing about the middle of April. At this time another light application of cow manure is added to the soil to advance growth.

Ramie should not be irrigated, as it causes too rank a growth and makes the stalks branch. Branched and rank growing stalks produce a very poor and uneven fiber.

About June, the first crop is ready to be harvested. This is the hardest task, since the crop must not only be harvested and the ground cultivated and weeded but the fibers must be separated from the rest of the stems.

Harvesting of the Crop

The usual yield is three crops a year. Weather conditions may make the number two or four, but this happens only on rare occasions. Each crop yields about four tons of stems per acre.

The first crop gives a comparatively short grass, up to 30 or 35-in., and is generally sold to Japan. The second crop usually yields the longest fiber, more than 45-in., is softer and more yellow, and hence more attractive to American buyers than the first crop. The third crop is the least important and is harvested at the end of the year, usually in October.

The three crops under average conditions would yield approximately the following amounts of scraped fiber: First crop, 408 pounds per acre; second crop, 240 pounds; third crop, 195 pounds; total, 843 pounds. Under exceptional conditions—good weather and an abundance of fertilizer—the yield can be raised for the first crop to 780 pounds per acre; for the second crop to 480 pounds; for the third crop to 408 pounds; total, 1,668 pounds.

Early or late frosts, high winds, infectious insects or fungus, root rot, lack of manure, lack of cultivation, and weeds are factors which may spoil one or even all of the crops.

From the latter part of May, when the first harvesting begins, until the first killing frost, harvesting is carried on almost continuously. By the time the last of one crop has been harvested the first of the next is ready. For this reason the amount of China grass grown depends largely upon the amount of available labor.

AFTER THE HARVEST.

The pith and bark of the stalks must be separated from the fiber by a process called "stripping," which is merely the ripping of the bark and fiber from the pith, and is quickly done. Most of the labor is involved in the scraping process.

Before scraping, the stripped ribbons are soaked in water from two to three hours. Then three or four strips of peel are laid on a board at one time. The strips are scraped a few times on the inner side from bulb to point and then turned over and scraped on the outer side. The scraping removes the bark and pith and is done with dull steel or bamboo knives. After scraping, the fiber is dried and then done up in 40-pound bales. These bales constitute the finished China-grass fiber product handled by the native Chinese.

One laborer can strip from 10 to 13 pounds per day, but can scrape only 2 to 6½ pounds of fiber per day.

Production Costs

Labor for scraping, if hired, is reported to be very expensive—at least 8 to 20 cents American money per day plus five meals of good food—principally rice. Two reasons why this labor is so high are because rice fields demand large numbers of laborers and because scraping is considered more or less professional work. The cost of scraping adds from 1½ to 6 cents per pound to the cost of production.

Practically all of the scraping is done by hand. Machines have been introduced into China for the purpose of scraping the fiber, but they have not been able to compete with the cheap Chinese labor.

The cost of production, of course, varies greatly, due to such factors as varying yields, weather, amount of fertilizer used, cultivation, pests, etc. The following figures are based on an average crop under average conditions (three crops a year, with a yield of 840 pounds of fiber per acre):

Labor (on 1 acre):	Days' labor.
February; weeding and manure spreading	30
May, weeding and night-soil spreading	24
July, weeding and night-soil spreading	24
Three times scraping	180
Three times stripping	84
Drying	18
Total	360

Cost of production per acre (U. S. currency):	
360 days' labor at 16 cents per day	$57.60
Night soil	12.70
Cow manure	16.00
Total	86.30

Possibility of Increasing Production

At present the entire yield of China grass is consumed, but present indications point to a doubling or trebling of the demand for ramie fiber to be used in foreign markets for the manufacture of textiles.

Investigations throughout the interior growing districts show that there is an abundance of land adaptable to ramie culture, but there are three obstacles which stand in the way of increased production, as follows :

(1) *Labor.*—Ramie culture and its preparation for market consumption require a great deal of labor, which, in turn, requires capital before returns from sales are forthcoming. However, one-third advance payment is sometimes paid by purchasers of the fiber. This high cost of labor, therefore, tends to prevent large-scale production, as the farmers have not the capital to carry large burdens of expense for hired labor. The result is that the ramie farmer grows very little more, if any more, than can be handled by himself and family, despite the large profit derived from this crop.

(2) *Fertilizer.*—If successfully grown, ramie requires much manure, and as this is quite expensive and very much in demand in China, it is an obstacle which will limit production.

(3) *Chinese Customs.*—The Chinese customs tend to discourage a farmer from raising ramie on his farm if the same practice was not carried on by his ancestors.

However, due to the enormous area over which ramie can be grown and the increasing prices, it seems probable that the law of supply and demand will operate and that production will increase.

In order to stimulate production it has been proposed to operate foreign-controlled plantings of ramie in areas suitable for its growth and culture where it is not already grown. It is expected that this type of experiment, if successful, will interest neighboring farmers in ramie, with the result that they will follow the lead, plant the grass, and thus increase production.

Marketing of the Product

Dealers' marketing of ramie grass in China is a very intricate and many-handed process. Fiber for export is marketed in the following way :—

A. *First Deal.*—Farmer to local storekeeper, who is hired by a ground broker. Before the crop is harvested the local storekeepers, who are hired and financed by ground brokers, advance approximately one-third of the estimated buying price of the fiber expected to be raised by the farmer. This advance payment creates a contract between the ground broker and the farmer (the storekeeper is agent to broker). When the farmer harvests his crop and the fiber is ready for market, he delivers it to the local storekeeper, who in turn gives him the remainder of the purchase price. The storekeeper, as agent to the so-called ground broker, is paid on a commission basis, receiving from 2 to 5 per cent. of the first purchase price. However, as there are no written records kept by the farmer or the local merchant, it is not infrequent that the storekeeper buys from the ignorant farmer at an extremely low figure and adds a " squeeze " to the price when it is turned over to the ground broker.

As the local merchant accumulates the fiber he turns it over to his principal, the ground broker. The ground broker's interest in the grass is purely speculative. He holds it to his best advantage and sells it for what the traffic will bear. The individual ground broker has very limited capital, however, and as a result does not always keep the fiber till the right time, his money being needed for future purchases.

B. *Grass Hong.*—These ground brokers sell their grass to a grass hong. This hong is an association of buyers much like a guild. Practically all of the grass grown in China for foreign shipment is handled by this hong before it is sold to foreigners. The purpose of the hong's existence is purely speculative. Hankow is the headquarters of grass hongs and is also the foreign buying centre of China grass.

C. *Compradore.*—It is the practice of Chinese dealers or hong men never to deal directly with a foreigner but through a compradore, who acts as the foreign firm's go-between buyer. Each foreign firm has its own compradore, who buys from the native Chinese and sells to his firm. The foreign firm makes a contract with its compradore to buy so much fiber at a stipulated price and the compradore guarantees to supply it, adding his commission of 1 to 3 per cent.

D. *Foreign Exporting Firms.*—Several foreign exporting firms, especially those in Hankow and Shanghai, handle ramie fiber for export. In most cases they handle the grass on a commission basis, charging from 3 to 8 per cent., according to circumstances.

Thus it will be found that under the above and existing method of marketing the grass passes through the hands of producer, local storekeeper, the ground broker, the grass hong, the compradore, and the foreign exporting firm before it finally reaches the consumer or textile manufacturer. This means that the fiber passes through five dealers, all of whom add their profit or commission, or both.

The problem which confronts the consumer who wishes to get the grass at a reasonable figure is how to eliminate some of the dealers. However, from all outward appearances, to establish a new system of marketing for part or all of the exported China grass fiber would be a very slow and expensive undertaking. It would be necessary to create an extremely large organization. Under these circumstances the expenses of the organization might be more than the savings due to eliminated dealers, and at any rate very large amounts of fiber would have to be handled to warrant such a large organization. This is a problem which calls for serious consideration in view of the increasing foreign demand.

Transportation and Handling

Hankow, as before stated, is the centre of the ramie fiber market and is the point to which most of the fiber is shipped and where it is put on the market for sale to foreign or domestic consumers. Besides the fiber that is shipped to Hankow, small amounts go to Shanghai, and somewhat larger amounts are used locally for the manufacture of grass cloth.

Most of the fiber is shipped to Hankow via the Yangtze River and its tributaries. Whether the grass is grown up or down the river from Hankow, that is the port from which it is shipped. For instance, fiber grown in Kiangse province is shipped to Kiukiang, which is a port on the Yangtze River, about 142 miles down from Hankow, and from which it is shipped upstream to Hankow.

The grass en route to Hankow is carried in Chinese junks, which resemble antique sail and row boats, varying from 20 to 40-ft. in length and carrying from 1 to 5 tons. They are manned by coolie sailors.

The fiber is sacked in native bales weighing about 40 pounds each. After arriving in Hankow the small native bales are carried on the backs of Chinese coolies to the godowns (warehouses) of the hong dealers. It is from these warehouses that the grass is purchased by exporters. When the grass is sorted into different qualities, about 10 per cent. of it is rejected. Foreign purchasers rebale the fiber into 500 to 600 pound bales. These bales are then carried by coolies to the Yangtze River docks, where they are loaded into ocean steamers.

Native transportation is very crude, involving a great deal of hand labor and more or less delay, but, due to the low wages paid, it is not overly expensive. The following is a tabulation of costs connected with handling of fiber :—

	Per ton.
Average freight to Hankow	$3.40
Coolie hire	2.29
Packing and baling, Hankow	10.20
Export duty	4.58
Insurance and interest	3.38
Freight to the United States	10.00
Total	33.85

Consumption of Ramie Fiber

The estimated figures of the Chinese chamber of commerce for the production of China grass fiber show an average annual yield of 26,000 tons. Of this amount about 10,000 tons are consumed in China. The figures following, given out by the Chinese customs, show the amount exported and the value :—

Year.	Pounds.	Value.	Value per pound.
1919	28,125,467	$3,798,657	$0.135
1920	24,936,000	3,576,409	.143
1921	26,298,933	2,123,255	.800
1922	24,970,666	2,443,046	.970

More than half of these exports go to Japan. England and Germany get a large share, while the amount taken by the United States is very small.

The following table shows the countries to which exports of ramie fiber were made during the years 1919, 1920, 1921 and 1922:

VALUE OF EXPORTS OF RAMIE FIBER FROM CHINA, 1919-1922.

Countries.	1919 *Haikwan taels.*	1920 *Haikwan taels.*	1921 *Haikwan taels.*	1922 *Haikwan taels.*
Japan	2,533,937	2,385,818	2,538,104	2,659,805
Germany	—	2,657	21,412	111,625
Great Britain	57,228	302,878	156,005	59,304
Hongkong	66,262	72,787	40,756	53,765
France	26,170	41,468	15,800	31,580
French Indo-China ..	14,716	19,893	20,107	21,939
United States	4,746	541	—	3,967
Italy	129	7,833	—	674
Siam	3,265	3,080	1,217	468
Philippines	423	—	353	212
Singapore, Strait Settlements	2,386	—	—	90
Netherlands	16,292	31,178	—	—
Belgium	7,060	16,068	—	—
Austria and Hungary ..	233	—	—	—
Total	2,732,847	2,884,201	2,793,754	2,943,429

Current Prices of Ramie

The following table gives the average prices for the three most common and best-known grades of ramie in the Hankow market. These prices are given in Hankow taels per picul, covering cargo delivered f.o.b. steamer Hankow in export bales, including export duty:—

PRICES OF RAMIE PER PICUL IN HANKOW TAELS.

Date.	Puchi. *Hankow taels.*	Wuchang. *Hankow taels.*	Yuenkiang. *Hankow taels.*
1922:			
June	20.70	21.60	21.90
July	19.50	20.10	21.70
August	22.20	22.60	—
September	22.50	23.50	—
October	23.50	24.50	—
November	—	26.00	—
December	—	26.00	—
1923:			
January	—	25.00	—
February	—	24.00	—
March	—	26.00	—
April	—	24.00	—
May	—	25.00	—
Opening prices for 1923 crop	21.50	22.50	25.29

NOTE.—Average value of Hankow tael for above periods was approximately $0.7567.

Only Wuchang grass was available in any material quantity after November, 1922. Since January, 1923, practically none of the 1922 crop has been available and the prices shown on Wuchang grass are more or less speculative.

Methods of Financing the Crop

Finance in China carries with it a large risk of exchange, especially when dealing directly with the producer. The following units of money, which are continually changing in relative value, are used in domestic exchange: Cash (smallest unit); coppers; Mexican dollars; taels.

The farmers use cash, the coolie labor is paid in coppers and small money, domestic freight charges are paid in Mexican dollars, and the banking business is done in taels. The difference in exchange values of these various kinds of money make their study an important factor in the ramie fiber business. The exchange value between Chinese money and gold standard money is also constantly changing. Under the present system of financing ramie fiber, the following steps are necessary:—

1. The ground brokers furnish the storekeepers 30 per cent. of the estimated value of the immediate future crop. The local storekeepers, as the ground brokers' agents, turn this 30 per cent. advanced payment over to the farmers and thus bind them on the future delivery of their crop. When the delivery is made they are paid the remaining two-thirds of the value of the crop.

2. The grass hong members at Hankow buy the grass direct from the ground brokers on a cash or credit basis, but usually cash.

3. If the grass is to be used for Chinese consumption, it is bought direct from the hong by the Chinese manufacturer for cash or credit.

3—A. If grass is exported, the foreign exporter opens a letter of credit in a Hankow bank. The firm exporting the grass receives payment from the bank holding the letter of credit on presentation of their documentary draft, bill of lading attached.

3—B. Tfe exporting firm must finance the purchase of the grass from the time it purchases it from the hong until it is shipped and bill of lading is presented to the bank. If the firm is a responsible one, Hankow banks advance them a packing credit, on which the firms draw to cover expenses incurred in connection with the purchasing, packing, etc.

If the consumer created some means of buying more directly from the producer, the risks of exchange would still remain the same, but the method of financing purchases, packing, etc., would also have to be more direct. However, it could still be carried on under a letter of credit placed in a Hankow bank.

The grass is usually insured "with average" before shipment, as it is subject to damage by water. There is also a 5 per cent. export duty in China, which must be paid by the consumer. At the present time there is no import duty on the fiber in the United States.

CHINESE WOOD OIL

(Continued from page 170).

surfaces by treating with a modified Chinese oil, which is stable up to 100° C., and solidified at 160° C.

In the application of Chinese wood oil as a drying oil it has been found that at ordinary temperatures it dries more rapidly than linseed oil, but at higher temperatures the reverse is the case. The Chinese wood oil film is firmer, less elastic and "tacky" than that of linseed oil. Howse (*Brit. Pat.*, 152,095 of 1919) proposes the utilization of nitrated Chinese wood oil as a rubber substitute and insulating material.

The Future of the Industry

The demand for high-quality Chinese wood oil for European countries is steadily increasing, but the quantity available appear to be influenced seriously by the political and economic conditions of the inner provinces of China. Consular reports affirm that at periods extensive oil-producing areas are entirely isolated by the activity of bandits in these particular localities. A U.S. consular report for 1921 states that "there is room for a considerable improvement in the methods of cultivation, harvesting, and expressing, and the installation of modern machinery would, it is stated, increase the production by at least 10 per cent. To further the continued growth of this promising industry in China, government aid is urgently needed. Nurseries should be established where tree selection can be carried out for the benefit of the grower. The present crude methods of crushing the seeds result in a great amount of waste."

China's Hair-net Industry

THE export of hair-nets from Shantung in 1913 to the United States was valued at $719. In 1922 it was valued at $319,322. The hair-net industry is one of China's war babies.

The human hair-net was first manufactured in Austria, and a large industry was built up there which easily drove out the French silk hair-net industry; cottage labor in the Austrian mountains being used. But the Germans, apparently, quickly discovered in Shantung not only a remarkable source of human hair, but an abundant supply of the cheapest labor in the world, and the manufacture of the nets was transferred to Shantung. The goods were still, however, marketed from Austria, and the secret of the cheap manufacture, namely the use of Chinese labor, carefully guarded until a careless worker left a scrap of a Chinese newspaper in a package containing a net, according to the story. An American buyer discovered this, and investigation disclosed the real source of the nets. This brought American capital into the hair-net industry, and at the present time most of the production is in American hands. The principal consumer has always been the United States. The Chefoo trade report of 1922 show an increase in the exports of hair-nets from Hk. Tls. 2,858,000 in 1920 to Hk. Tls. 7,175,000 in 1921 and states that the hair-net industry now dominates the local trade and industry, in value of goods produced, in amount of work involved, in number of persons employed, and in its effect upon the local standard of living. Shantung is the home of the industry, but at present keeps its hold only on the manufacture. The raw material, human hair, is purchased all over China, notably at Hankow, Canton and Hongkong, and shipped to Europe or America, where it is chemically treated, and then returned to China, where it is made up into nets in the villages, and then re-exported in finished form, chiefly to the United States, with England and France next important takers.

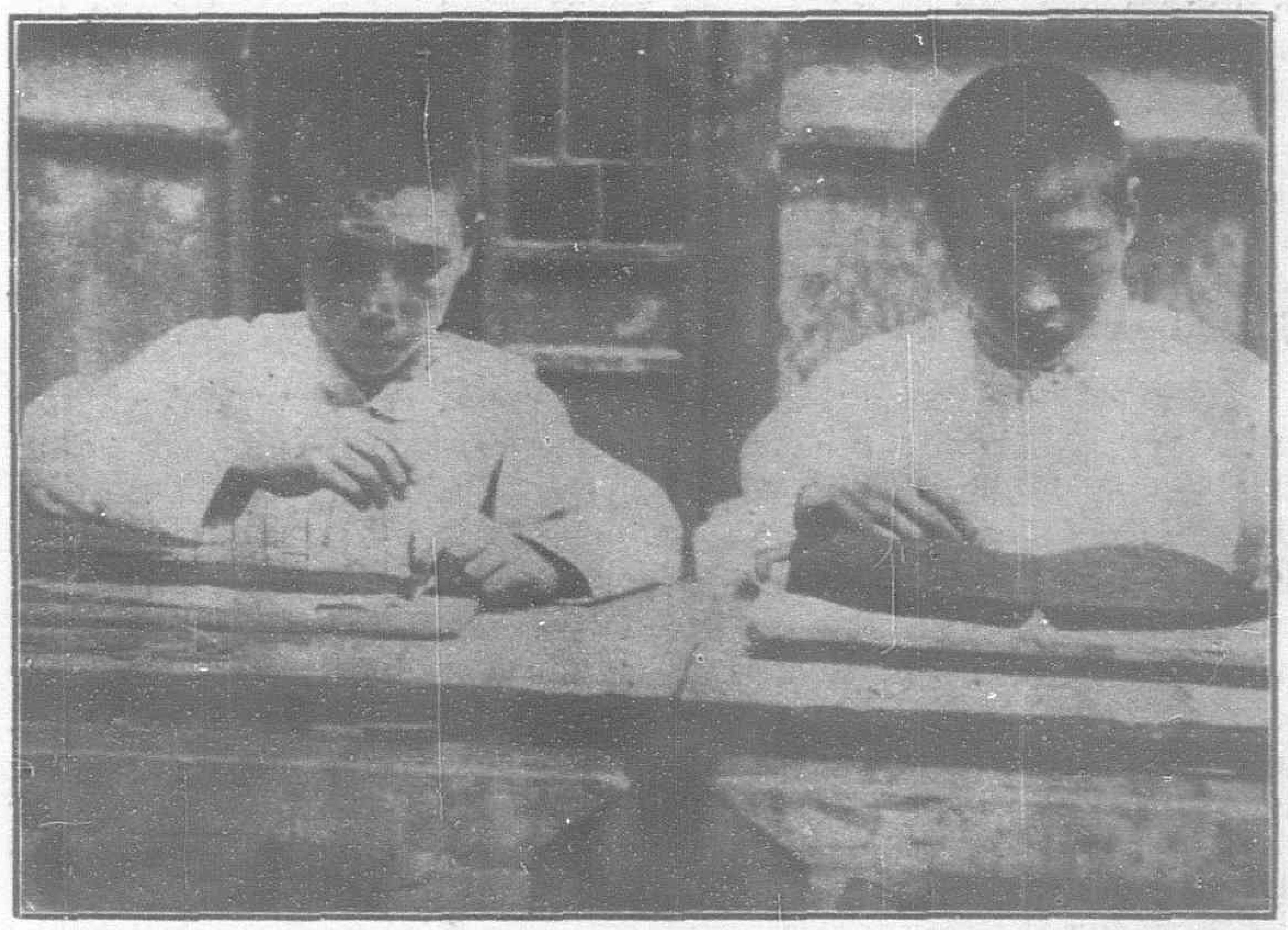
Repairing hair-nets in the warehouse of a large exporting firm

The original cause for the growth of the hair-net industry in China was the abundance of cheap and usable human hair. The rule of the Manchus compelled men as well as women to wear long hair, and the overthrow of the republic threw this hair on the market. Poverty and famine compell women to part with their hair at low rates; Chinese economy saves the cuttings and combings. It is also said that Chinese hair, being coarser, is stronger and more adaptable than the fine hair of European women for the making of hair-nets.

The second advantage which helped China to take the industry away from the rest of the world is the cheapness of labor. The highest paid employee in the hair-net industry, the inspector, receives $25 Mex. per month, while the workers receive from $22 down to $9 monthly, the latter being the minimum wage for fourteen-year old girls. The average labor cost is one American cent per net, involving a thousand knots to complete. The impossibility of competing with this low labor cost is obvious. Foreign firms are able to provide well-lighted rooms, clean conditions for the workers, regular intervals for food, double pay for over-time and Sundays, and three days holiday a month, and in some cases full pay if sick for a day or two; and still find labor costs extremely low.

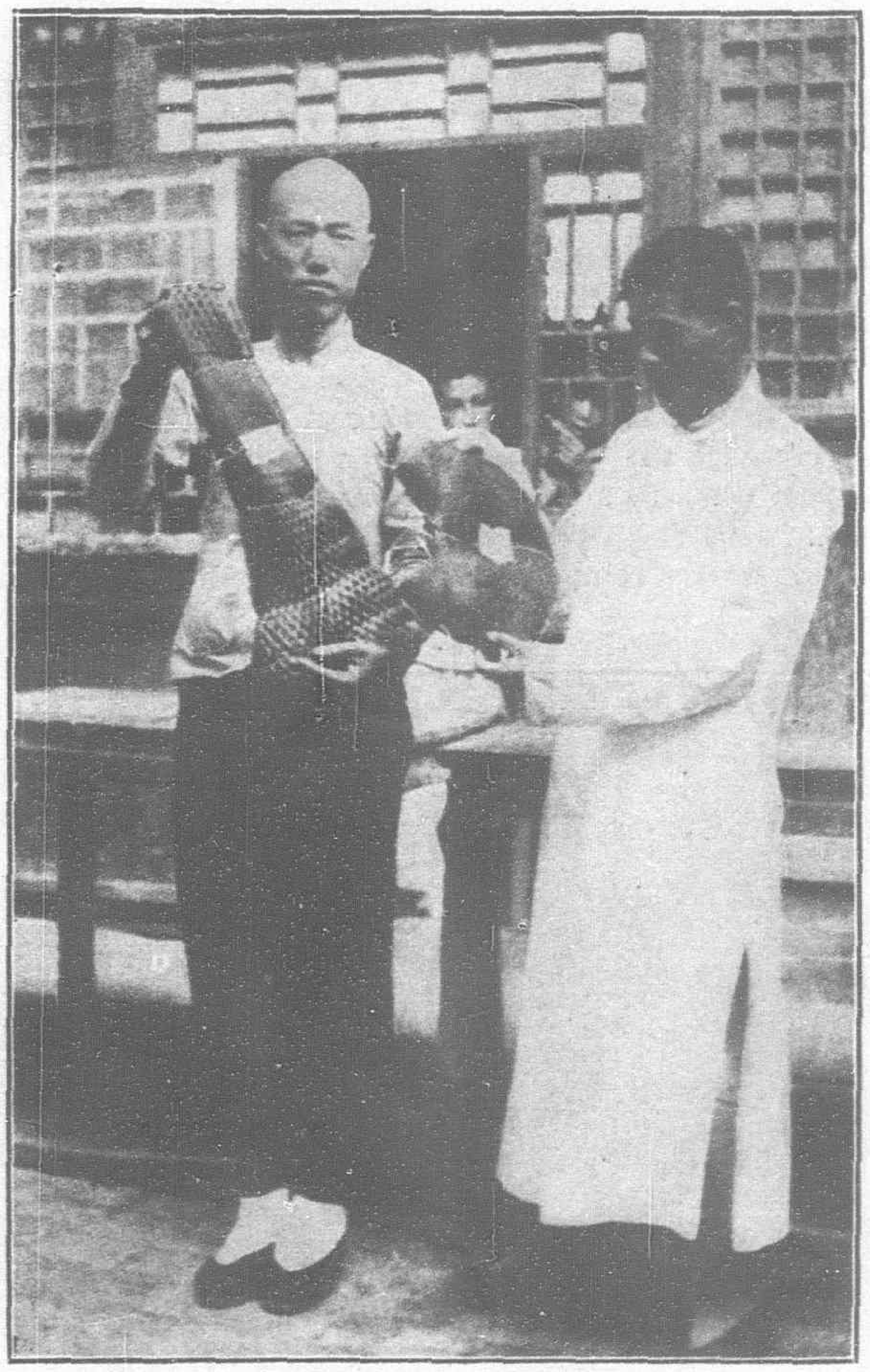
The placing of the nets in paper envelopes ready for the retail seller, most firms have found much more profitable to have done abroad, as although the foreign girl's wages are many times greater, she can be depended upon to pass only perfect nets, a very essential point, and at the same time divides imperfect nets into second quality and discards.

Famine victims learning to make hair-nets



Tying up the nets in one-gross lots

One more essential stage in the process cannot feasibly be done in China, chemical treatment, and this necessitates the shipment of the raw hair to Europe or America for chemical treatment. When the hair has been properly sorted, dyed, sterilized, it is re-shipped to China to be woven into nets in Shantung.



Hair-nets as they are shipped

But as the industry has developed, the preparation of the hair has also been transferred in great part to China. Probably nine-tenths of the hair-nets exported from China at present are made from hair that has been prepared in that country, though the Chinese firms have not yet mastered the scientific processes and their product is somewhat impaired by crude methods and careless treatment. At least one American firm has already completed arrangements to prepare its own hair in China under the supervision of expert American chemists. The various colors are thus produced for hair-net making, namely, light, medium and dark brown, blond, black, auburn, and white.

The making of the nets is done in the village homes, giving the advantage of greater cheapness, while the repair work is done in work shops in and about Chefoo which give the advantage of better inspection. The industry spread rapidly from village to village in Shantung when the big growth came in 1914; trained teachers were sent through the country side by firms who trained the girls on condition that when they had learned the trade, which takes about a month, that they sell their goods exclusively to the company training them. The pay is judged by all western standards, pitifully small, but according to the village standards is very good, and is welcomed by the parents.

Home manufacture has its serious disadvantages as well as its merits. Nets made by the piece, with no chance for supervision, naturally are not as well made as in a factory, where the work can be supervised by experts. Many of the nets bought by the exporting firms are imperfect and have to be gone over carefully, one by one, before shipment. This is done in the workshops run by the exporting firms in such cities as Chefoo.

The repair work has created abnormal conditions in Chefoo. It has raised all wages, as the work is so simple and easy, save perhaps on the eyes, and workers so much in demand that it attracts labor from every direction. The American mission, for instance, has the utmost difficulty in keeping women nurses, and when the minimum earning of girls of 14 years is $9 their parents are not prepared to work longer, as they can live on the earnings of their families. The higher standard of living which such earnings allow, raises the price of food, while the influx of country folk for such work has raised house rent several times, both by creating a shortage and because several workers can afford to share a house at $15 or $20 a month, dispossessing an ordinary tenant who paid $5 and cannot afford the landlord's demands.

One of the explanations of the rapid development of this industry while other industries are slow to take advantage of the local cheap labor, lies in the fact that machinery is not needed. Cheap labor alone has not made possible the development in the same area of industries requiring large capital outlay in equipment, but in the hair-net industry the only tools necessary are a small brass shuttle and a bamboo splint. On a nail driven into a table or chair the first loop of the net is fastened. The hair is wound into the shuttle, like thread into a bobbin, and as each new loop is tied it is slipped into the bamboo splint like a stitch on a knitting needle. Thus, with shuttle in one hand and bamboo splint in the other, the maker adds knot to knot and loop to loop until the net is completed.

The nets are then tied together in bunches of one gross each. For this a piece of board, into which nails have been driven is provided, and the loops on the edge of the net are slipped over the nails until a pile of 144 nets is made. They are then tied with thread and are ready for the agent when he comes to collect, pay for making, and to leave more hair. Tying into one-gross bunches, as well as tying the hair into one long thread and putting it into the shuttle, is often done by some member of the family who is not able to make the nets. Thus the industry fits in well with Chinese home life.

The hair-net comes in various shades. The hair of the Yak's tail, because of its whiteness and length, is very desirable when mixed with other shades in producing a silvery effect that matches grey or partially grey hair. The raw hair is graded according to length, the first grade exported being dressed in lengths of from eighteen to thirty-six inches, while the second grade is made up of strands measuring fifteen inches or under. The price of hair for export during 1922 ranged between $200 and $800 per hundred catties.

America consumes mostly cap nets of the sizes 8 by 38, 10 by 38 and 12 by 38, while Europe uses principally the so-called fringe nets.

There is no difference in the prices as to the colors with the exception of grey and white, which are always more costly.

The industry was threatened at one time by careless handling on the part of exporters. The trade requires 90 per cent. perfect nets on arrival, though the nets are very fragile, and in 1920-1922 exporters shipped to the United States enormous quantities which turned out to be only from 40 to 50 per cent. perfect, a result of careless inspection and careless packing, the result being that millions of dollars worth of useless nets were lying about the New York market unsold and unsaleable.

The hair-net industry has for some time suffered from the present fashion among American girls of "bobbing" their hair and much money has been spent in propaganda work in America in order to retain the business by urging upon the women not to bob their hair.

To date the Chinese government has levied only slight taxes on the industry. Last year, however, a proposal was made by the government to tax this industry, which was met by strong representations on the part of the trade, who say that high taxation would take away the livelihood of millions and a profitable trade for China; the matter is still pending.

Another difficulty the trade is facing is the increased popularity of the double hair net, which lasts considerably more than twice as long as the single net, and is said to have already caused a serious drop in sales. Importers in the United States are said to be now in favor of a ratio of four single nets to one double net. The difference between the two varieties lies in the use to which they are put. The double net holds the hair down and is suitable for sports and motoring; and is used by factory workers. The single net, which does not show as much, is used for dress occasions and the like.

Since demand for this commodity depends solely upon quality, the best import firms exercise great care in dealing only with well-established firms, for only strict supervision on the production end can insure quality.

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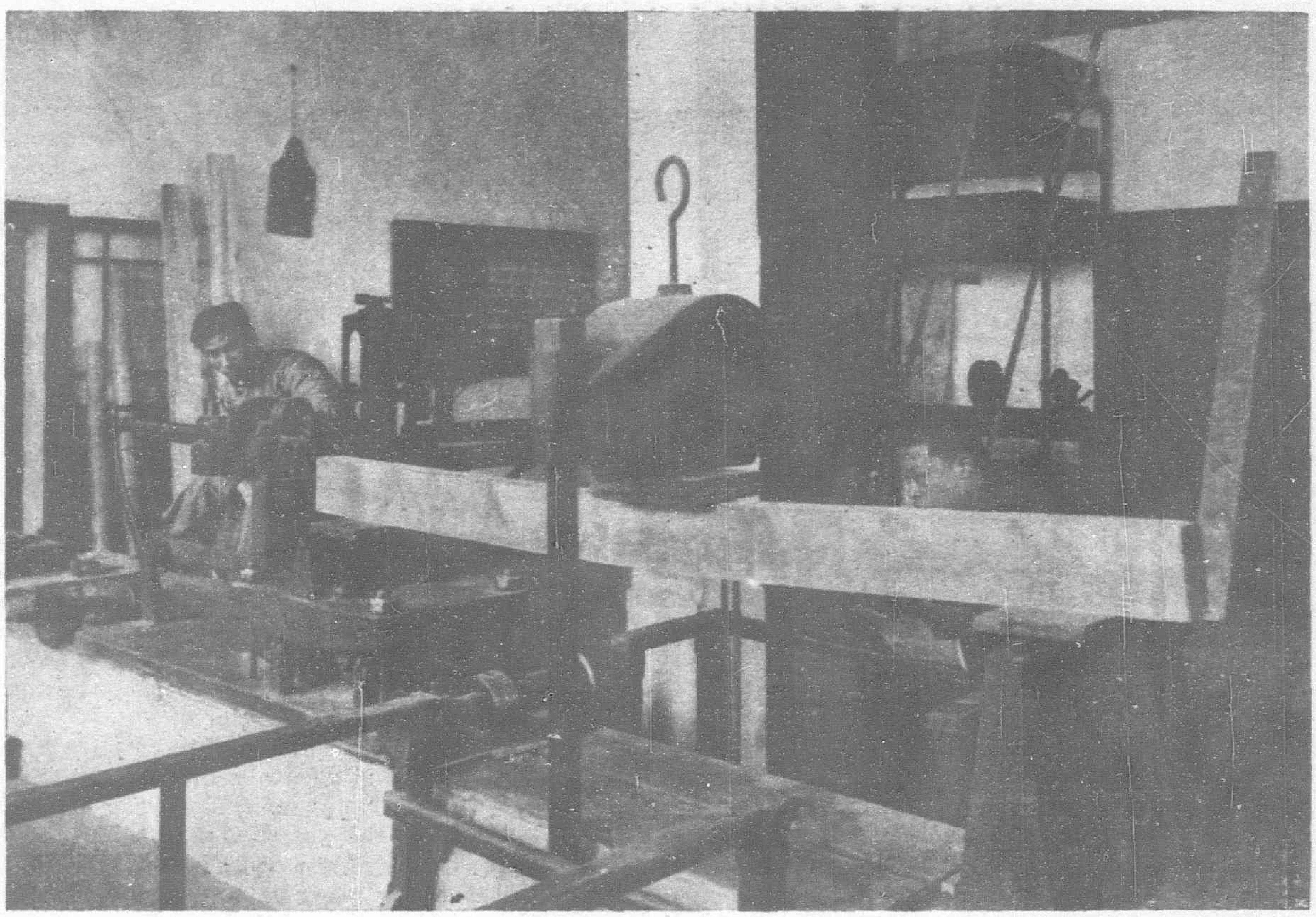
*Illustrations from "The National Geographic Magazine."

Chinese Engineering Materials

Joseph H. Ehlers

Editor of the "Journal of the Association of Chinese and American Engineers"

OF the great nations of the world to-day, China alone has no organization or facilities for studying the materials of construction. As a consequence, engineers are handicapped for lack of data on locally produced materials; and are therefore often compelled to resort to the use of expensive foreign materials whose properties are better known, and which are purchased in accordance with carefully prepared specifications regarding methods of production and the physical and chemical properties required.



Bending test on timber beam at the Pei Yang University Engineering Material Laboratory

It seems unbelievable that a country with 400,000,000 people, with enormous engineering projects planned on every hand should have neglected so vital a subject as the testing of engineering materials; yet such has been the case. Not only has there been practically no work in the nature of an investigation to determine the properties of native products, but often products have been used in actual construction without testing of the quality of the several shipments of materials.

Many materials peculiar to China are adaptable to modern construction, for example bamboo, a material so scarce in most large countries as to be negligible as a material for use in construction; and hence but little tested; in China, abundant in many parts and well nigh indispensable. The peculiar economic conditions of China entirely alter the problem of the economic use of construction materials. Due to these conditions, such combinations of materials as lime and volcanic ash and similar mixtures; bamboo reinforcement for reinforced concrete for bearing and sheet piles; and other combinations uncommon in other countries must receive serious consideration in China. To convince the skeptical that these are practical matters, it ought only to be necessary to remark that lime—earth mixtures have been and are being used for much important building work; that prominent engineers believe that some hydraulic lime and volcanic ash mixture might economically be used on harbor projects now under consideration; that bamboo reinforced concrete piles have been successfully used on important work at a cost of not over one-half that of steel reinforced piles.

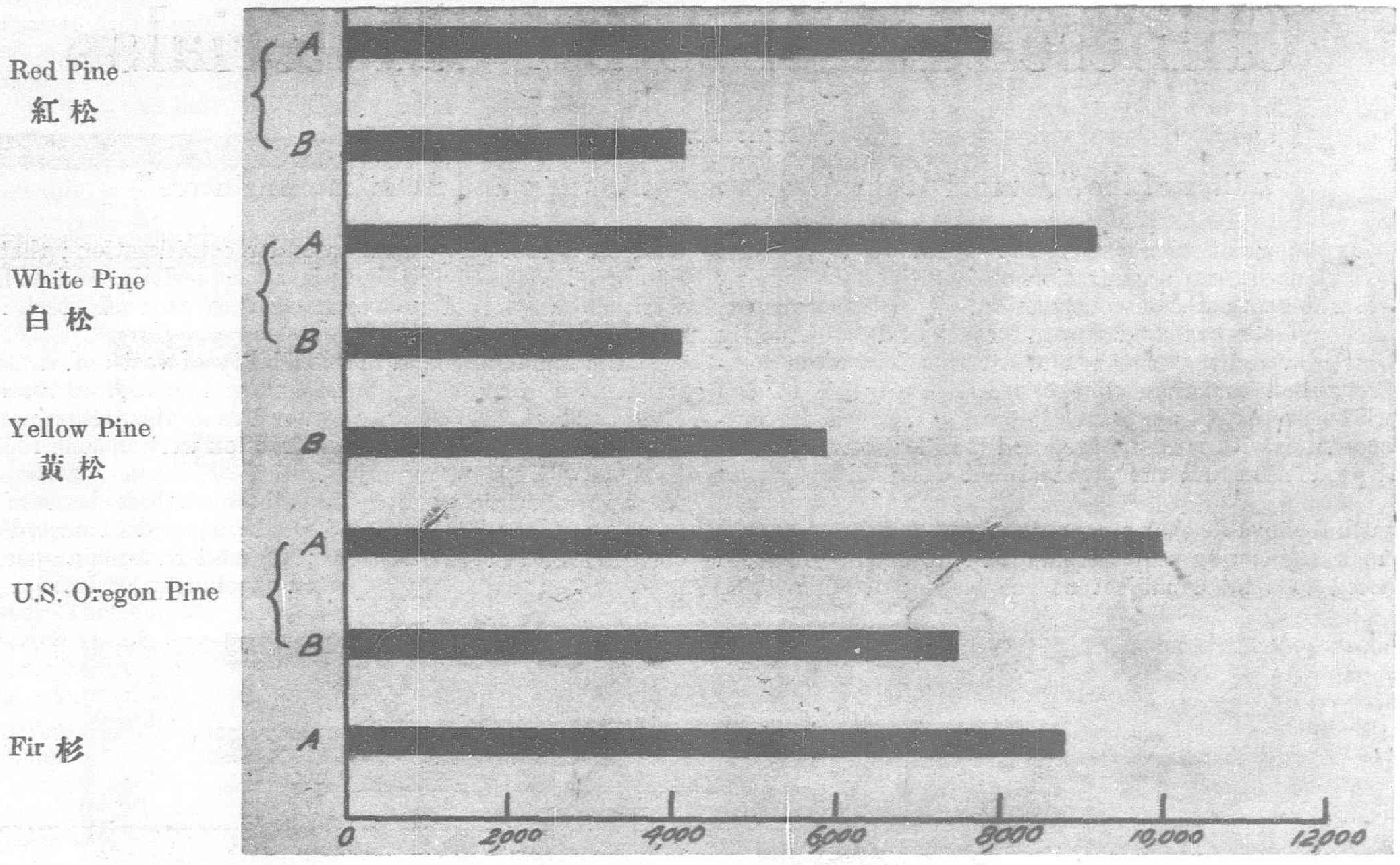
The remoteness and inaccessibility of vast and densely populated parts of China prevent, in these regions, the use of foreign style products, which are produced near the treaty ports of the coast or are imported; and construction work in such regions must be done with native materials.

In construction work in China there are three classes of materials to select from: (1) imported products, sold in accordance with carefully studied specifications; (2) modern foreign style materials produced in China by imported machinery of foreign methods, which may be purchased in accordance with specifications adapted from studies of foreign countries; and (3) typical native products, for which no scientific specifications regarding manufacture or properties exist, as they have never been subjected to scientific classification or experiment. Little can be done in determining the most economic materials to use until the properties of the native materials have been thoroughly investigated.

The principal features of such an investigation would be to make studies (1) of the quality of and working stresses for masonry of native bricks; (2) of the merits and properties of various lime mixtures; (3) of the use of bamboo as a substitute for steel for reinforcing for reinforced concrete for temporary structures; (4) of the quality of the cements produced here; and (5) of the properties of Chinese timbers.

This work would fall into four parts: (1) laboratory tests; (2) field tests; (3) examination of existing structures; (4) classification of each product and the formulation of specifications for control of producing processes and for physical and chemical requirements, based not on specifications for foreign products but on a study of what can be best produced here (varying designs to adapt them for

STRENGTH OF CHINESE TIMBER. TRANSVERSE TESTS ON LARGE BEAMS



Transverse strength in lbs. per sq. in. Note: A. Seasoned; B. Green

Chinese materials if necessary). The basic work is the determination of strengths by laboratory tests.

The government has evidenced an interest in undertaking some work along these lines when conditions are suitable for progressive endeavors. The writer was appointed an honorary technical councillor to the ministry of communications in 1922 in this connection and urged by the minister of communications and the director of the railway department to do everything possible to further the interests of the study of materials for construction work in China. By extensive travel and through personal contact with those in a position to assist, he has endeavored to promote an interest in this work and effect a means whereby something may be accomplished even under the present conditions. Eminent men in this field, such as Dean Middleton Smith of Hongkong University, who has done much testing of great value, have offered to co-operate, and the university testing laboratories have offered to assist. The various river conservancies are undertaking some investigations in connection with their own construction work. Foreign construction interests will undoubtedly do some work in connection with projects in their hands. And thus when and if the Chinese government endeavors to effectively organize the facilities for testing and establish any bureau for co-ordinating the work, and undertaking some of its own, it is hoped that it may find considerable data already at hand and some of the preliminary work done.

Some work has been done under the writer's direction on the following materials: timber, bricks and brick masonry, lime mixtures, cement, bamboo reinforced concrete, building stone.

Timber

Timber is a difficult material to classify in regard to strength owing to the great variation in strength shown by different specimens of the same wood. Differences in age of tree from which it is cut, climatic influences, season of felling, seasoning of the timber, as well as defects, exert a great influence on strength. Timber of structural grade should be purchased to satisfy certain specifications. Native timber is not often so graded.

Small test specimens should be of thoroughly sound wood, and the values of strength deduced from tests on such specimens must be interpreted as applying only to properly graded or carefully inspected timber, and not to the average timber found on the Chinese market.

As an indication of the variation in strength that may be expected in tests, note the following values from tests on longleaf pine made by the United States department of agriculture:

Weight	29—64-lb. per cu. ft.
Tensile strength	1.85—13.4 tons per sq. in.
Compressive strength ..	2.04—4.05 ,, ,, ,, ,,
Bending strength ..	1.9—7.65 ,, ,, ,, ,,
Shearing strength ..	0.21—0.58 ,, ,, ,, ,,

Much work has been done in the investigation of Chinese wood from a botanical standpoint, but little from an engineering viewpoint. Dean C. A. Middleton Smith of Hongkong University has tested many timbers used in South China, coming from the Philippines and from Borneo. Japanese authorities have done some valuable work on the timbers of Manchuria.

Tests on large numbers of specimens are necessary before reliable values of strengths can be obtaind. Many of the following tests were made on commercial timber as purchased in the local market. Although the past history of most of such timber was unknown, the degree of seasoning is revealed by the moisture content test. There are also many tests on green timber, as well as some on thoroughly seasoned timber. Specimens of important commercial woods were collected from various parts of the interior for testing. A great number of tests relate to Manchurian red pine and Manchurian white pine, the most widely used native timbers in North China.

Many of the largest timber using districts are entirely denuded of forests. The timber of the interior is used locally, except that grown in the valleys of the Yangtze and Yellow rivers where large quantities are floated down in rafts. Manchuria and Siberia, as well as Japan, are important suppliers of timber. Woods from the Philippines, Borneo, and Australia are used extensively in South China. Much Oregon pine is imported into all parts of China from America.

It is not considered desirable to attempt to specify allowable unit stresses for Chinese timber on the basis of the insufficient number of tests thus far made however, engineers using Chinese timbers in their designs may be guided by these results, and by applying a factor of safety depending on the importance of the work and the care with which they expect to inspect the purchased timber, may work out reasonable unit stresses. It is believed that not over four-fifths of the stresses allowable for oregon pine structural timber should in any case be permitted.

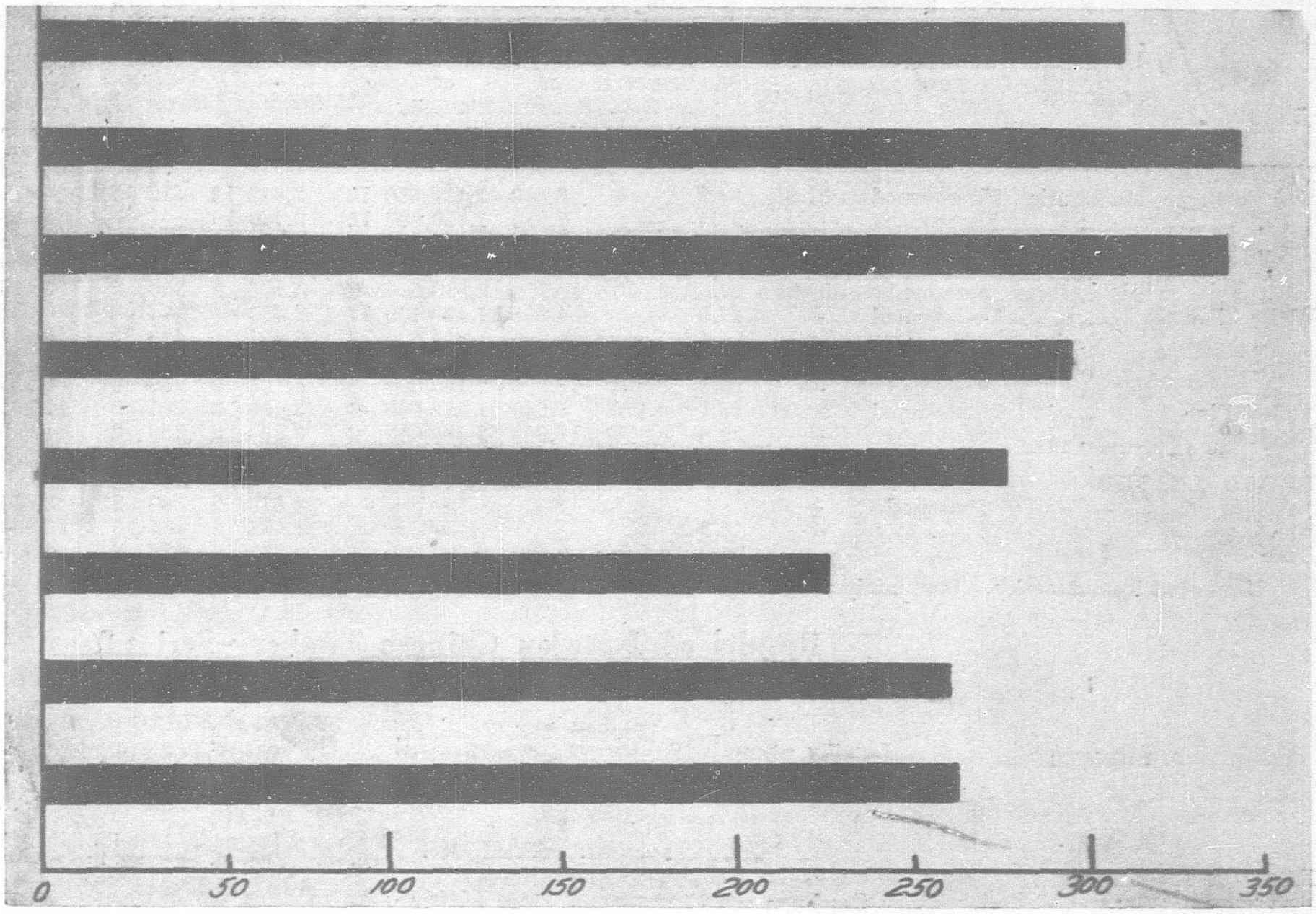
Some results of timber tests are shown: also some results of tests on Borneo and Siam woods used in South China are appended for reference.

A sample summary report form shows the general sizes of specimens used.

Cement

Some tests on cements used extensively in northern China are shown. These particular tests were from samples taken from cements from the market and were made simultaneously under the same conditions, largely by Mr. J. L. Chen, associate member A. C. A. E. under the writer's supervision, and they are in fair agreement with other tests on these cements made in this laboratory. The names of the brands are of course omitted as there is no justification for classifying cements on the basis of a few tests on random samples. What is desired is to impress on users of cement the necessity of testing all cement on the job, for even some shipments of the best cements may not be up to standard.

COMPARATIVE TENSILE STRENGTHS OF CEMENTS TESTED



Tensile strength in lbs. per sq. in. 1:3 sand briquettes, 28 days

Crushing Strength of Far Eastern Timbers Tested in the University of Hongkong

Name of Wood	Country of Origin	Mean Crushing strength parallel to grain lb. per sq. in.	Mean Crushing strength parallel to grain Tons per sq. in.
Billian	British N. Borneo ...	11,177	4.99
Selangan Batu ...	,, ...	8,713	3.89
Mirabow	,, ...	7,997	3.57
Mai Takien ...	Siam	6,470	2.89
Camphor... ...	British N. Borneo ...	5,532	2.47
Oba Sulu... ...	,, ...	5,398	2.41
Kruen	,, ...	4,860	2.18
China Fir ...	South China ...	4,030	1.80
Mai Yang ...	Siam	3,783	1.69

Bending Strength of Far Eastern Timbers Tested at the University of Hongkong

Name of Wood	Country of Origin	Coeff. of Bending Strength Tons per sq. in.
Selangan	British North Borneo	8.06
Billian	,, ...	7.29
Mirabow	,, ...	6.77
Mai Takien	Siam	5.38
Camphor	British North Borneo	4.93
Greenting	,, ...	4.92
Oba Sulu	,, ...	4.92
Orat Mata	,, ...	4.57
Kruen	,, ...	4.45
Kacha	,, ...	4.24
Red Serayah ...	,, ...	3.54
Mai Yang	Siam	2.99
Black butt	Queensland	5.79
Spanish oak ...	St. Vincent	5.78

Pei Yang University

Engineering Materials Laboratory

TIMBER TEST REPORT—SUMMARY SHEET.

Results of tests on *Manchurian Red Pine* Locality *Manchuria* Seasoning *Unseasoned* Moisture content 32.0 per cent. weight per cu. ft. 34.2-lb.

CROSS BENDING :—15 tests

Size of test pieces	6-in. by 12-in. by 12-ft. 0-in.
Modulus of rupture	3,649-lb. per sq. in.
Modulus of elasticity	1,136,500-lb. per sq. in.

COMPRESSIVE STRENGTH :—12 tests

Size of test pieces	3½-in. by 3½-in by 12-in.
Fiber stress at ultimate, parallel to grain	2,542-lbs. per sq. in.

TENSILE STRENGTH :—30 tests

Size of test pieces.	1¼ *cm.* by 3 *cm.* and length 52 *cm.* 1½-in. diam. and length 15-in.
Fiber stress at ultimate, parallel to grain	6,650-lbs. per sq. in.

SHEARING STRENGTH :—10 tests

Size of test pieces	6-in. by 6-in. by 12-in.
Ultimate stress, perpendicular to grain...	605-lbs. per sq in.

REMARKS.—Average results of tests on all specimens from 5 logs.

Cement No. 1

NORMAL CONSISTENCY :—Vicat needle ; 25.50 per cent. of water.

FINENESS :—Residue by weight.

No. 100 sieve 2.66 per cent. No. 200 sieve 15.58 per cent.

SPECIFIC GRAVITY :—Le Chatelier's bottle ; 29.50, 29.69.*

INITIAL SET :—Gilmore : 5 hrs. 50 min.

FINAL SET :—Gilmore : 9 hrs. 10 min.

SOUNDNESS :—Neat pats.

Air test O.K. Normal water test O.K.

Steam test O.K. Boiling water test O.K.

TENSILE STRENGTH :—Briquettes one sq. in. section.

		Neat		1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests ...		4	4	4	4
Average Strength ...		402	623	214	276

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		3:9 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests			4	4
Average Strength ...			1414	2005

CHEMICAL ANALYSIS :—SiO_2 17.88 per cent. MgO 1.52 per cent. SO_3 1.51 per cent.

* Sample heated.

Results of Tests on Chinese Timber—Series 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
					STATIC BENDING				COMPRESSION				TENSION		SHEAR		
									Parallel to Grain		Perpendicular to Grain						
SPECIES	LOCALITY WHERE GROWN	SEASONING	Moisture Content	Wt. per Cu. Ft.	Fiber Stress at E. L.	Modulus of Rupture	Modulus of Elasticity	No. of Tests	Ult. Stress	No. of Tests	Ult. Stress	No. of Tests	Ult. Stress parallel to Grain	No. of Tests	Ult. Stress perpendicular to Grain	No. of Tests	REMARKS
			Per Cent.	lbs.	lbs. per sq. in.	lbs. per sq. in.	lbs. per sq. in.		lbs. per sq. in.		lbs. per sq. in.		lbs. per sq. in.		lbs. per sq. in.		
NEEDLE LEAVED																	
Red Pine	Manchuria	Unseasoned	31.99	34.2	—	3,649	1,136,500	15	2,542	12	417	15	6,650	30	506	10	From the same log
,,	,,	Six months	—	27.2	—	3,010	1,320,000	12	3,780	10	—	—	6,195	10	745	10	
,,	,,	Seasoned	10.25	—	—	5,598	1,135,700	11	3,810	22	—	—	6,850	7	1,177	14	
,,	,,	Unseasoned	40.57	29.9	4,200	5,755	1,062,000	4	4,100	21	304	10	8,500	14	1,239	10	
,,	,,	Seasoned	22.2	27.5	6,050	10,200	2,810,000	2	4,705	2	360	2	7,275	2	1,303	2	
White Pine	,,	Unseasoned	—	27.3	—	4,895	1,159,700	17	2,433	—	177	—	6,923	—	462	—	From the same log
,,	,,	2 Years	12.46	24.4	—	5,885	1,892,000	17	3,981	26	429	26	6,412	12	985	26	
,,	,,	Unseasoned	80.71	27.6	3,250	5,330	1,160,000	4	3,260	5	163	5	6,830	15	1,047	7	
,,	,,	Seasoned	—	25.8	6,335	12,520	2,160,000	2	4,185	2	259	2	6,125	2	906	2	
Yellow Pine	,,	Unseasoned	50.09	28.1	4,170	5,940	1,218,000	4	3,000	3	281	5	11,200	12	1,430	5	
Larch	,,	Seasoned	—	29.8	6,370	12,900	2,480,000	2	3,860	2	366	2	4,500	2	355	2	
Oregon Pine*	,,	Seasoned	—	37.7	—	10,200	2,265,000	1	6,160	2	618	2	6,875	2	1,410	2	
BROAD LEAVED																	
Ash	——	Seasoned	—	—	—	—	—	—	4,615	2	590	2	8,650	2	2,438	2	
Elm	——	,,	—	43.8	—	—	—	—	4,455	2	465	2	15,600	2	—	—	
Lime	——	,,	—	35.0	6,320	9,800	2,400,000	1	3,860	2	589	2	6,050	2	1,465	2	

*Imported from America. Commonly used in China.

Results of Tests on Chinese Timber—Series 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14
						STATIC BENDING			Compression Parallel to Brain				
SPECIES	Locality where Grown	Rings per in.	Proportion of Summer Wood	Moisture Content	Wt. per. Cub. Ft. Basedon Volume when Tested	Fiber Stress at E. L.	Modulus of Rupture	Modulus of Elasticity	Fiber Stress at E. L.	Crushing Strength	Compression Pependcular to grain Fiber Stress at E. L.	Tension Parallel to Grain	Shearing Strength Parallel to Grain
			per cent.	per cent.	lbs.	lbs. per sq. in.	lbs. qer. sq. in.	1000-lb. per sq. in.	lb. per sq. in.	lb. per sp. in.	lb. per sq. in.	lb. per sq. in.	lb. per sq. in.
NEEDLE LEAVED													
Best Sha-mu (Fir)	Szechuan	27	43	19.0	28.4	50.80	9,200	1,340	5,640	7,640	610	7,320	1,837
Sha-mu (Fir)	,,	12	30	13.8	27.9	3,820	7,640	807	3,480	4,850	682	5,010	1,522
Hung Tou Sha (Red Bean)	,,	27	40	12.0	23.7		—	—	3,650	5,170	813	—	674
Average Sha-mu (Fir)	Hupeh	8	42	13.0	25.0	5,140	8,500	1,190	3,910	5,870	642	4,890	1,070
Liu Sha (Fir)	Chekiang	14	35		31.8	6,900	11,140	1,420	3,940	5,540	—	11,460	568
Chen Sha (Fir)	,,	7	31			4,690	7,980	1,285	—	—	396	8,430	775
Po-mu (Cypress)	Szechuan			18.3	32.2	4,490	9,060	1,340	5,590	7,400	1,180	8,170	700
,, (...	Chekiang	6	32	17.0	36.3	7,350	14,540	1,240	4,770	1,220	1,280	7,760	1,157
Red Pine	Manchuria	18	45	11.3	25.3	3,590	5,490	1,332	—	—	—	7,610	—
Huang Hwa Pine	,,	21	37	11.1	29.4	3,620	7,080	1,553	—	—	—	6,610	—
White Pine	,,	12	35	96.1	23.7	3,740	6,320	1,516	—	—	—	9,226	—
Chekiang Pine	Chekiang	12	49	17.2	33.2	5,920	12,280	1,590	4,740	6,580	518	12,540	822
Foochow Pine	Fukien	11	40	11.5	34.6	6,760	14,630	1,553	5,163	6,800	660	7,030	933
BROAD LEAVED													
Yu (Elm)	Chihli	4	45	52.7	33.4	3,300	6,600	1,050	2,000	3,380	537	8,930	620
Willow	,,	5	30	56.0	29.6	3.620	6,090	867	2,180	3,120	409	7,060	672
,, ...	,,	5	30	12.9	27.0	6,330	11,240	1,300	2,660	4,530	688	—	946
Pai Yang (Poplar)	,,	7	35		33.9	4,810	7,820	1,608	3,500	5,240	543	9,290	860
Nan-mu	Szechuan	—	—	12.3	31.7	5,820	11,120	1,360	4,393	6,695	882	13,300	1,286
P'a	,,	8	28	14.7	26.8	—	—	—	3,170	4,710	474	7,360	1,242
Pai Ye-ho	,,	—	—	12.5	26.7	—	—	—	4,945	6,635	1,510	6,010	—
Tzecheng	,,	—	—	12.5	49.3	—	—	—	5,070	7,610	—	—	1,620
Feng	Chekiang	—	—	32.2	—	—	—	—	2,600	4,260	701	—	1,023
Wu-tung	,,	4	22	11.1	38.8	3,670	7,340	995	2,440	3,500	583	4,160	567
Huai	,,	7	32	—	—	—	—	—	2,820	5,080	1,263	—	1,364
Tuan (Lime)	Manchuria	12	44	95.0	—	3,140	5,300	1,250	2,740	4,620	583	10,300	—

Cement No. 2

Normal Consistency :—Vicat needle ; 22.78 per cent. of water.

Fineness :—Residue by weight.

No. 100 sieve 3.72 per cent. No. 200 sieve 18.78 per cent.

Specific Gravity :—Le Chatelier's bottle ; 3.099, 3.107*

Initial Set :—Gilmore : 5 hrs. 50 min.

Final Set :—Gilmore : 8 hrs. 20 min.

Soundness :—Neat pats.

Air test O.K. Normal water test O.K.

Steam test O.K. Boiling water test O.K.

Tensile Strength :—Briquettes one sq. in. section.

		Neat		1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests		4	4	8	8
Average Strength ...		521	631	215	317

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests			4	4
Average Strength ...			1488	2603

Chemical Analysis :—SiO_2 21.80 per cent. MgO 1.14 per cent. SO_3 1.05 per cent.

* Heated sample.

Cement No. 3

Normal Consistency :—Vicat needle ; 21.86 per cent. of water.

Fineness :—Residue by weight.

No. 100 sieve 3.64 per cent. No. 200 sieve 19.07 per cent.

Specific Gravity :—Le Chatelier's bottle ; 3.106, 3.166*.

Initial Set :—Gilmore : 4 hrs. 10 min.

Final Set :—Gilmore : 7 hrs. 40 min.

Soundness :—Neat pats.

Air test O.K. Normal water test O.K.

Steam test O.K. Boiling water test O.K.

Tensile Strength :—Briquettes one sq. in. section.

		Neat		1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	8	8	12	12
Average Strength ...	68	497	727	161	250

Compressive Stength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	4
Average Strength ...	4200	9680	763	2420

Chemical Analysis :—SiO_2 21.02 per cent. MgO 1.29 per cent. SO_3 0.82 per cent.

* Heated sample.

Cement No. 4

Normal Consistency :—Vicat needle ; 23.69 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 1.47 per cent. No. 200 sieve 17.70 per cent.
Specific Gravity :—Le Chatelier's bottle ; 3.098, 3.101*.
Initial Set :—Gilmore : 5 hrs. 30 min.
Final Set :—Gilmore : 8 hrs. 30 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	8	8
Average Strength ...	232	594	636	175	218

Compressive Strength :—Pounds per sq. in Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	4
Average Strength ...	5460	7085	1251	2022

Chemical Analysis :—SiO_2 18.72 per cent. MgO 1.20 per cent. SO_3 0.97 per cent.

*Heated sample.

Cement No. 5

Normal Consistency :—Vicat needle ; 27.00 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 3.20 per cent. No. 200 sieve 16.72 per cent.
Specific Gravity :—Le Chatelier's bottle ; 2.964, 2.984*.
Initial Set :—Gilmore : 5 hrs. 40 min.
Final Set :—Gilmore : 9 hrs. 20 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests		4	4	8	8
Average Strength ...		400	455	154	240

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests			4	4
Average Strength ...			1090	1745

Chemical Analysis :—SiO_2 19.72 per cent. MgO 1.52 per cent. SO_3 1.51 per cent.

*Heated sample.

Cement No. 6

Normal Consistency :—Vicat needle ; 23.47 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 0.29 per cent. No. 200 sieve 18.82 per cent.
Specific Gravity :—Le Chatelier's bottle ; 3.100, 3.106*.
Initial Set :—Vicat : 3 hrs. 52 min. ; Gilmore : 5 hrs. 32 min.
Final Set :—Vicat : 8 hrs. 12 min. ; Gilmore : 8 hrs. 32 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	7	6	11	11
Average Strength ...	233	640	704	219	298

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	5	5	4
Average Strength ...	7700	9250	1620	2580

Chemical Analysis :—SiO_2 21.76 per cent. MgO 1.47 per cent. SO_2 1.54 per cent.

*Heated sample.

Cement No. 7

Normal Consistency :—Vicat needle ; 23.37 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 1.46 per cent. No. 200 sieve 18.90 per cent.
Specific Gravity :—Le Chatelier's bottle ; 3.143, 3.151*.
Initial Set :—Vicat : 3 hrs. 30 min. ; Gilmore : 4 hrs. 0 min.
Final Set :—Vicat : 5 hrs. 50 min. ; Gilmore : 7 hrs. 10 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	14	12
Average Strength ...	330	599	638	230	312

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	5	4	5	5
Average Strength ...	6640	8300	1375	2040

Chemical Analysis :—SiO_2 21.44 per cent. MgO 1.22 per cent. SO_3 1.75 per cent.

*Heated sample.

Cement No. 8

Normal Consistency :—Vicat needle ; 22.56 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 3.51 per cent. No. 200 sieve 22.77 per cent.
Specific Gravity :—Le Chatelier's bottle ; 3.097, 3.112*.
Initial Set :—Gilmore : 5 hrs. 20 min.
Final Set :—Gilmore : 7 hrs. 0 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.
Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	8	8
Average Strength ...	267	636	717	230	298

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	4
Average Strength ...	8070	9460	1750	2790

*Heated sample

Chemical Analysis :—SiO_2 18.58 per cent. MgO 1.68 per cent. SO_3 1.37 per cent.

*Heated sample.

Art of Making Cloisonne Being Rehabilitated

Cloisonne ware was originally made for and used exclusively by the imperial family, the general public knowing little about it, and in the course of time cloisonne manufacturing became a lost art, says a recent government bulletin from China, giving a resume of the decline and rehabilitaion of this industry.

The making of cloisonne in Peking dates back to the time of the Ming dynasty. Its name in Chinese, Ching Tai Lan or Ching Tai Blue, is held to suggest that cloisonne ware first made its appearance in Peking during the reign of Emperor Ching Tai, of the Ming dynasty—1450-1456. Restricted to the use of the imperial family, for whom it was specially made, in time practically no new cloisone was made.

In the latter part of the eighteenth century the Emperor Chine Lung, of the late Tsing dynasty issued an edict permitting the people to manufacture this hitherto forbidden ware, and a sudden revival in the art resulted. The work of the Chien Lung period fell into three broad classes, those with gold, silver or copper for their foundation and partition. Some of the finest pieces were of pure gold, not only the structure of the actual vase or article, but also the metal partitions or wires, laid on the ware to form figures and designs to be filled in with the Enamel, were likewise of fine gold. The silver and sopper cloisonne were made in the same manner but of cheaper metals. The pigments and the enamel used in the manufacture of cloisonne were procured from certain mines in the country.

Imported Southdown sheep in the pens of the Kungchu-Ging Experiment Station of the S. M. R.

The Chinese Wool Industry

Transportation a Great Problem in Disposing of Fleece Raised in Remote Regions

IN 1922 China exported some 8,077,600-lb. of camels' hair, 67,679,000-lb. of sheep wool, and 2,034,400-lb. of goat hair. Of the wool exported 62,523,000-lb. went to the United States. The total amount produced is not obtainable.

Of the total shipments of China wool in 1922, 57,848,100-lb. were exported through Tientsin. Of the wool that comes into this port, roughly speaking, 50 per cent. is from Tsinghai and Kansu, 15 per cent. from Shansi and Shensi, 25 per cent. from Mongolia and 10 per cent. from Chihli and Shantung.

The development of the wool industry in China faces three very important problems: Producing the wool clean and free from impurities, such as sand, dirt and moisture; improving the breed of the sheep; and delivering the wool to market at a reasonable transportation charge.

There are a few hand presses for baling wool in several places in the interior, and washing, drying and packing plants are located in Shihisuitzu, Kalgan and Chungking, but these plants cannot begin to handle all the wool produced, even in the provinces in which they are located. Therefore, a very large amount of dirt and other foreign matter contained in the wool is carried to the seaboard, and, with the high transportation and native shipping charges, it is really surprising that wool can be delivered to tide water at a price which will find a market. The cost of packing, cleaning, transportation, and transit tax is nearly 60 per cent. of the initial cost of the wool at the source of supply or point of production or collection.

The transportation of wool into Hsining from Tsinghai is probably the most interesting problem. The wool is twisted into a rope of over 2-in. in diameter, while still wet, to prevent it from blowing away, is then dried and tied with goat hair ropes into packages weighing 175-lb. to 200-lb. It is then ready to be shipped to Kalgan. If there is an immediate demand for wool it is sent by camel either to Fengchen or Kalgan, which takes about 50 days. If there is no great rush it is held and floated down the Yellow river in the spring and autumn on rafts made of sheep or cattle hides. This method is both quicker, taking only about 30 days, and cheaper, but these advantages are outweighed by the danger of the wool becoming wet or discolored if packed air-tight. Therefore, unless the market demands an immediate supply, the slower and more expensive way is more often the cheaper in the end.

Transportation to markets in Shantung has the advantage of the railways and the Grand canal, and charges are not quite so high. This wool is usually brought into the collection centres in bags or tied up with mats, and will average from 160-lb. to 200-lb. per package.

In Eastern Mongolia, with its principal distributing point at Chihfeng and Dalianor, the wool comes packed in hemp bags tied with ropes and is sent either to Kalgan or Chinchow, the distance being about equal. As the Chinchow district is very mountainous the wool goes entirely by pack animal, each animal carrying about 320-lb., with the cost averaging 3.50 taels per animal for the trip. Between Dalianor and Kalgan carts drawn by cattle are used, each cart carrying approximately 525-lb. The cost per cart for the distance of 470 *li* (175 miles) is about 3.00 taels. From Sining, an important trading centre, to Kalgan, the transportation charge is 41 per cent. of the initial cost of the wool at the source of supply.

Therefore, it may be seen that the export trade of China in wool is suffering from lack of cheap transportation, and that all of China's produce which comes to seaboard from any distance in the interior is operating under the same severe handicaps. This, coupled with the fact that the quality of wool is the same as it has always been, and that no effort has been made to improve the wool through breeding, makes the growth of the wool trade of China quite remarkable. In the province of Yunnan there is an experiment being tried out by the French with some imported rams with the idea of sending the improved wool back to Ffance. In the province of Honan, the first effort on the part of native stock raisers to improve their stock is being made. The only experiment on any scale is now being tried out by the Japanese in Manchuria. They have imported merino, Southdown and Shropshire rams to cross with the native sheep, and have given themselves 20 years to work out their plans, claiming that the results so far have fully justified their hopes in ultimate success.

Japan Welcomes Opportunity to Electrify

AN interesting and highly significant aftermath of the terrible Japanese earthquake is to be recognized in an order just placed with an American firm for an unusually large quantity of portable electrical household air-heaters.

The ill wind that blew such disaster to Nippon in September apparently carried with it the germ of a happier order of things. The Japanese, ever quick to grasp opportunity, immediately and methodically set about the gigantic task of reconstruction—which involved first the caring for refugees.

Having in mind the remarkable part played by electricity through radio during the holocaust—thanks to which the outside world was rushing succor within twenty-four hours—the Japanese authorities began at once to enlist the aid of this powerful friend of humanity. It became evident that much of the fire damage following the earthquake resulted from the national habit of using *hibachi*, or small charcoal fire pots, which from time immemorial have supplied the frugal Japanese householder with heat and comfort.

Japan may yet have to thank this combination of glowing coal pots and paper walls for what is perhaps the most significant advancement in her national development—the wider use of electrical household devices by a people who are steeped in tradition and have followed the footsteps of their ancestors for year after year. It is just this quality of faithfulness that will so firmly establish a wider use of electricity in Japan once the people have had more opportunity of learning about it—and it is just this opportunity that the authorities are so wisely giving them during the trying period of reconstruction, when all machinery and apparatus installed must be of the highest quality and able to stand up under most unusual conditions.

The International General Electric Company of New York, at the request of the Japanese, is equipping house after house and barrack after barrack with light, heat and power—the germs of Western civilization. Springing up among the blackened ruins are row upon row of sanitary emergency quarters, carefully wired for electricity by judicious authorities, who have already laid out a vast scheme of electrical development the practicability of which will first be tested in miniature over a period of months, before building permits for permanent construction are issued.

From present indications America will have to look to her laurels as Japan apparently intends to electrify on an intensive scale never before undertaken by an entire nation and based on an ambitious scheme of intelligent national development which will call into use a great amount of potential electrical power.

II.—Petroleum Production and Trade of the Dutch East Indies

(Concluded from March Issue).

At the present time there are 10 refineries in the Dutch East Indies. These are located as follows: One in Borneo, four in Java, four in Sumatra, and a small topping plant at Boela Bay on the island of Ceram, one of the Moluccas.

Borneo

At Balikpapan, on the east coast of Borneo, is located the largest refinery in the Dutch East Indies. Its daily capacity is well over 15,000 barrels of crude, and it handles approximately 5,000,000 barrels of oil annually, or about six-tenths of 1 per cent. of the world's total production. The total crude storage here is placed at 3,000,000 barrels. This plant is the property of the Bataafsche Petroleum Maatschappij, a subsidiary of the Royal Dutch-Shell. The oil is received at the refinery through pipe lines from the various parts of the Koetei field. The longest of these is a 5-in. line to the Sanga-Sanga wells, 65 miles distant.

The refining methods used are quite modern, although they hardly measure up to the standard processes followed in America. The crudes obtained from the different horizons of the field vary from a light oil of 0.84 specific gravity to heavy asphaltic grades up to 0.96 specific gravity, so practically all petroleum products from light distillates to asphalt and dyestuff bases are produced. A sulphuric-acid plant it also run in conjunction with the factory. The benzene and gasoline manufactures, amounting to over 50,000,000 gallons annually, is of such excellent quality that it does not require a sulphuric-acid treatment before it is marketed. Most of this product goes into the export trade, there being a good demand for it, especially in Europe and other countries of the Far East, except British India.

Balikpapan, the great oil-refining centre in Borneo

By the adoption of the Edeleanuan process of washing kerosene with sulphuric acid (H_2SO_4) to free it of tarry products, the Balikpapan plant is now producing annually over 25,000,000 gallons of high-grade kerosene, which finds a ready market throughout the Orient. A late press report mentions that the kerosene unit at Balikpapan is to be enlarged at a cost of $1,600,000.

Some of the Borneo crudes from the Koetei field yield a very high-grade paraffin, and consequently the product of the Balikpapan plant is well known in world commerce. All commercial grades of paraffin are manufactured, ranging from 125° to 140° F. melting point. The paraffin exports from this point totaled over 42,000,000 pounds in 1921, most of it being shipped to the United States, China, Japan, and the Netherlands. Until recently there was a large candle factory at Balikpapan, which was dismantled and moved to Shanghai because labor is more plentiful in China and, furthermore, that country is the principal market for these candles. Balikpapan shipped more than 8,600,000 pounds of candles in 1921, China taking nearly 6,600,000 pounds of this quantity.

Some of the heavier oils from the Koetei pools refine into fair grades of lubricating oils. The final products do not compare with American brands, but as a result of constant laboratory researches and the adoption of advanced refinery technique the quality of these oils has been greatly improved wthin the last few years. About 2,000,000 gallons of lubricating oil were exported in 1921, most of it going to Singapore for re-distribution.

One of the largest fuel-oil stations in the Orient is maintained at Balikpapan in connection with the refinery. There is storage capacity for 365,000 barrels and facilities for bunkering vessels within a few hours. Official statistics for 1921 show an export business of over 1,400,000 barrels of fuel oil for this one point.

On Tarakan Island, off the northeast coast of Borneo, there is a plant for preparing the crude of this field for fuel oil. A simple process is used for removing any sand or water, after which it is ready as a bunkering oil without further refining. There is storage on Tarakan Island for about 860,000 barrels of crude and 560,000 barrels of fuel oil. Over 4,000,000 barrels of crude and fuel oil were shipped from here during 1921, about half of this amount being credited to Japan.

Java

The Dordtsche Petroleum Maatschappij, subsidiary of the Bataafsche Co., has two refineries in east Java. One is at Wonokromo, just outside of the port of Soerabaya, and the second is at Tjepoe in the Rembang residency, west of Semarang. The Wonokromo factory, established about 1890, can handle 800 barrels a day, although lack of a constant supply of oil generally forces this plant to run at less than full capacity. The crude worked here comes by tank cars from the several concessions in Soerabaya Residency, although there is a small pipe line to a well in the immediate neighborhood. Wonokromo has storage tanks for 100,000 barrels of crude in addition to refined-oil tankage.

A low grade of kerosene, all of which is marketed locally, is the chief product of this factory. Lubricating oils also are made and sold to the Java sugar and rice mills and to the motor trade. However, these locally made lubricants are not very popular, because of their poor quality. Some little gasoline is manufactured, but it has a bad odor, and is consequently difficult to sell unless specially treated or mixed with better grades.

Distribution of products from Wonokromo is chiefly by the State railroad, although considerable quantities of kerosene are shipped to the interior by small river barges on the Kali or River Brantas. Native-owned ox-carts, which load up to forty 5-gallon tins, likewise do a good freighting business in illuminating oil in competition with the railroad.

The factory at Tjepoe, a property of the Dordtsche Petroleum Maatschappij subsidiary of the Bataafsche Co., was first established in 1894. It is a complete plant with a daily capacity of 2,000 barrels, although its run depends upon the amount of crude available. This supply comes from the concessions in Rembang and Semarang residencies and is conveyed to the refinery by several short 6-inch pipe lines. Storage tanks are maintained for about 660,000 barrels of crude, besides smaller tanks for refined or partially refined products.

The Tjepoe gasoline and kerosene, all of which is sold locally, is of very good quality, although hardly comparable with the output of the Sumatran and Borneo units. Shipments of these products are largely by railroad, but there is considerable distribution by prauw or flat-bottomed barges on the Begawan and Solo Rivers. The figure showing the yearly amount of kerosene made at Tjepoe is not available, but the two units Tjepoe and Wonokromo produce together about 20,000,000 gallons. As the crude obtained here carries a high-grade paraffin, especially suitable for candles, there is a small candle plant run in connection with the refinery. The candles manufactured have a high melting point and are therefore more desirable for use in the tropics. The entire output is marketed locally except for a few tons that find their way into the export trade.

The Algemeene Petroleum Compagnie, and independent company owning the Klantoeng-Sodjomerto concession in the Semarang residency, has a small refinery at Klantoeng. A little kerosene is made and sold to the natives. The residue is used as fuel at the plant or sold locally when there is a surplus. About 2,600 barrels were handled in 1920.

The Nederlandsch Koloniale Petroleum Maatschappij, a subsidiary of the Standard Oil Co. of New Jersey, has but recently constructed a small refinery at Kapoean in the Rembang residency. The capacity of this plant is 250 barrels daily, and it will take care of the crude from this company's Petak and Tremboel concessions, which produced 22,081 and 4,044 barrels, respectively, in 1920.

Sumatra

The four refineries in Sumatra are located at Perlak, in the Atjeh residency, at Pangkalon Brandan, in the Oostkust residency, at Pladjoe, and at Bagoeskoening, both of the latter plants being just below Palembang on the Moesi River.

At Perlak the Bataafsche Co. owns a complete factory for the distillation and refining of gasoline. Storage is provided here for 50,000 barrels of crude and up to 15,000 barrels of refined products. This plant is connected with the refinery at Pangkalan Brandan, a distance of about 76 miles, by a 6-in. as well as a 10-in. pipe line.

The refinery at Pangkalan Brandan, property of the Bataafsche Petroleum Maatschappij, is the largest in Sumatra. It is on the Babalan River about 13 miles from Pangkalan Susu, the port for the refinery. The Pangkalan Brandan factory was built in 1892 and has been enlarged from time to time until at present it can handle 10,000 barrels of crude daily. There is storage for over 1,000,000 barrels of crude and 50,000 barrels of fuel oil, besides tankage for refined products. In addition to the pipe lines between Perlak and Pangkalan Brandan as mentioned above, there are four lines, a 10-in., two 6-in., and a 4-in., between the refinery and the terminal at Pangkalan Susu, where there is a can factory (capacity 12,000 tins daily, filling plant, and storage for 300,000 gallons.

The two refineries in the southern Sumatra field are at Pladjoe and at Bagoeskoening, just below Palembang on the Moesi River. The Bataafsche Co. operates these plants, and they constitute a complete unit, with a daily capacity of 5,000 barrels, for the manufacture of practically all petroleum products, especially benzine, gasoline, kerosene, lubricating oils, and greases. The crude is either piped to the refiners or transported in oil barges that bring oil down the Moesi River from Kajoe, and 8-in. pipe-line terminus from the North Babot field. Two 4-in. lines, 87 miles long, connect the Pladjoe factory with the Kampong Minjak field, and still another line 141 miles long brings oil from the Melamoen district. Crude storage is available up to 1,300,000 barrels.

The output of these retineries goes largely into the export trade, there being a good demand for the various products in the Orient, Europe, Africa, and Australia. The following quantities were exported from Palembang during 1921: Kerosene, 22,000,000, gallons; benzine and gasoline, 38,000,000 gallons; lubricating oils 660,000 gallons; and lubricating grease, 389,000 pounds, besides, small quantities of crude, fuel oil, and asphalt. Products intended for local consumption are distributed largely by native craft and steamers on the Moesi River and its several tributaries. Shipments to the other islands of the colony are handled by the Nederlandisch Indische Tankboot Maatschappij, the interisland transportation company operated by the Royal Dutch.

The crude from the northern Sumatran fields is very rich in light distillates, and yields 30 per cent. or more of high-grade gasoline in addition to 40 per cent. or more of excellent kerosene. No recent figures are available that show the gasoline and kerosene output of the two refineries in northern Sumatra, but an estimate for 1921 based on the crude available places the benzine at about 40,000,000 gallons and the kerosene at 50,000,000 gallons. A large part of these north Sumatran products is sold in the colony, principally in Java. The exports, principally to the other Asiatic countries, amounted to approximately 51,000,000 gallons* of gasoline and benzine and 40,000,000 gallons* of kerosene during the same year.

Ceram

There is a small topping plant on Boela Bay, on the northeastern coast of Ceram, an island in the Amboina residency. This plant was formerly the property of the Rembang Industrie Maatschappij and was located at Wadoe, a station on the Netherlands Indian Railroad between Semarang and Soerabaya. The property was taken over by the Dordtsche Petroleum Maatschappij in 1918, the refinery being dismantled and set up again at Boela Bay in order to take care of the Ceram production. The crude of this field, which approximated a third of a million barrels in 1921, is topped for the lighter products, which are then sent to Balikpapan for the final refining processes, the residue being sold at the small fueling station maintained at Boela Bay.

Petroleum Market

Annual Consumption

The output data of the refineries in the Dutch East Indies are not available in a form to give a basis for a consumption calculation by products. Such refinery information is generally published after it is several years old and then only for a portion of the refinery units, so that it is impossible to gain a very definite idea of the amounts of kerosene, gasoline, lubricating oil, etc., produced locally. However, some idea of the market here can be gained by considering the consumption formula of "production plus imports minus exports." The latest totals available, those for 1921, show a local production of 17,000,000 barrels, or 714,000,000 gallons. The imports for the same period were 33,000,000 gallons, exclusive of grease, asphalt, and other solid products, while the exports totaled 473,000,000 gallons. The net amount, 274,000,000 gallons, represents the 1921 consumption of liquid petroleum products, which is approximately 5.5 gallons per capital for the 50,000,000 population. It may be stated that more than 70 per cent. of the total is consumed in the island of Java alone, if one bases an estimate on the percentage of the total population represented there, but actual figures, if available, would probably show even a slightly higher rate, as the Japanese are in much closer touch with the white race and are consequently larger users of mineral oils than the natives of Sumatra, Borneo, and the other smaller islands of the archipelago.

The imported products, largely kerosene and lubricating oils from the United States, represented about 9.5 per cent. of the consumption during 1914, about 9.6 per cent. in 1920 and 12 per cent. in 1921. (The export and import of paraffin, grease, asphalt and other solid products are not taken into consideration.)

Marketing Companies

There are three marketing companies doing business in the Dutch East Indies. They are the Dordtsche Petroleum Maatschappij, the Standard Oil Co. of New York, and the Vacuum Oil Co.

The Dordtsche Petroleum Maatschappij was first established at The Hague in 1887, with a capital of $30,000, which was increased to $140,000 in 1890. This company made steady progress and gradually obtained control of the Java production, which it refined in its plants at Wonokromo and Tjepoe, Java, and sold on the local market. In 1911 the Dordtsche company was taken over by the Bataafsche Petroleum Maatschappij of the Royal Dutch-Shell and was made the marketing company of this group in the entire Dutch Indies. Additional capital was authorized until it now stands at $800,000.

The head office of this company is at The Hague, with Sir Henri W. A. Deterding, director general, as the chief executive. The production in Java and the marketing in the Indies are directed from the main office in Soerabaya, with J. Th. Vouck, jr., as general manager.

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* These totals includes exports from Poeloe Samboe, an oil installation off Singapore, where products of the northern Sumatran refineries are stored and distributed. Poeloe Samboe also re-exports some products originally received from British Borneo and Persia.

Branch offices under Dutch managers are maintained at all important ports and large marketing centres, so that this company is well organized to hold its share of the petroleum-product market, of which it controls about three-quarters of the business.

Kerosene was the first American mineral-oil product to be sold in the Orient. Its introduction into the Dutch Indies came about by the selling at auction at the various ports of cago lots of case kerosene. These were generally bid in by wealthy Chinese, who distributed this oil among the smaller dealers. An American company has all the business in imported kerosene, except for small quantities from British Borneo and Persia, brought in by the Bataafsche Co. The market in imported lubricating products is divided between the two American oil companies, one of which deals solely in this product. Case gasoline was formerly imported and sold by one of the American oil companies, but this practice was discontinued during the world war.

GOVERNMENT POLICY TOWARD COMPANIES

The Dutch colonial government is impartial in its policy toward the several marketing companies. Foreign companies receive the same consideration in all matters with one possible exception, which is that the Dutch company is given a 5 per cent. preferential in bids submitted for the supply of mineral-oil products to the government.

Marketing Methods

The marketing companies follow two different plans for the distribution of products to the consumer. One method covers the disposal of kerosene and gasoline, and the second is used in the lubricating oil and grease trade.

KEROSENE AND GASOLINE

Kerosene and gasoline, or motor fuel, are sold through Chinese* bonded agents on a commission basis. These men are under contract to sell only the brands of their respective companies, and they receive a small commission on all quantities actually sold. Subagents are often appointed at minor distributing centres in order to push sales and to give better service to the trade. The transactions of these subagents are guaranteed by the head agent of the district. They receive a small selling commission, which is generally about half of the regular fee.

The oil companies protect themselves against financial loss by requiring a cash bond from the agent upon his appointment. This money, varying from a few hundred to several thousands of guilders according to the volume of stocks to be carried, is deposited with the company and a nominal amount of interest is allowed the agent, payable semi-annually. In many cases the agents give a credit mortgage on real estate in lieu of cash deposited with the oil company, and in some very exceptional instances European firms, when appointed as distributing agents, are allowed to give their personal bond promising the payment of all funds due the oil company. This agreement takes the place of the cash or credit mortgage bond of the Chinese or native agent. The agent is responsible for any credit that he may extend to his customers, so that the oil companies are absolutely protected against loss through bad debts.

The marketing companies provide storage for the agent, and his stocks are delivered to him with all transportation charges prepaid. Additional allowances are made to cover unloading costs, and under special circumstances delivery charges to customers may be credited by the agent. All warehouse leakage is for the agent's account. The agents sell at wholesale prices fixed by the oil companies, and deliveries to customers are generally made ex warehouse. The buyers, who are mostly small shopkeepers, resell at their own price, but competition tends to keep this down to within a few cents of the wholesale cost plus receiving charges. The natives buy their daily supply of lamp oil directly from the small shopkeeper or peddler in lots of a liter or less, according to the family budget.

Within recent years the oil companies have maintained field staff of traveling inspectors. These men are generally young Dutchmen or Americans, assisted by Chinese. It is the business of these men to be in close contact with the market and prevailing economic conditions in their respective territories, so that they may assist and advise the Chinese agents and generally promote the sale of their company's brands.

The locally made kerosene and gasoline reach the market in what are termed "naked tins," or the ordinary square 5-gallon petroleum cans which are the standard packing in foreign commerce. In recent years gasoline in 2-gallon drums has been introduced for the convenience of the trade. The American brands are imported in pine cases, with two 5 gallon tins, or a unit of 10 American gallons, to the case. The tinned oil is generally stripped of its case at the importing point and shipped to the up-country markets without this protection. The empty cases are sold separately and are in great demand for packing boxes in local industries. The empty tins also command a good price. These are seldom handled by the oil companies but are brought in by the Chinese or natives and are used in place of sheet tin for manufacturing different articles, or as containers for vegetable oils or other liquids.

Very recently the American company in the field has established can-making and filling plants for kerosene at several points where bulk oil is imported and filled for this market.

The Royal Dutch brands sold in the Dutch East Indies are Crown gasoline and Crown, Rising Sun, Key, and D.P.M.—Java kerosenes. The Crown is the best of these; Rising Sun and Key are intermediate grades; while the D.P.M.—Java is the cheapest.

LUBRICATING OIL

Lubricating oils and greases are marketed somewhat differently from kerosene. They are sold to the automobile owner through regularly appointed agents, generally dealers in motor accessories who buy their stocks outright from the oil companies. They agree to handle only the brands of the company they represent and to sell at prices as fixed by the oil companies.

The sugar-mill, rice-mill, and other factory trade in lubricants is eagerly sought by the different oil companies, and the competition is rather lively. Traveling salesmen, generally Dutchmen with some knowledge of lubricating engineering, visit the mills and factories periodically for the purpose of taking orders for the season's supply of lubricating oils and greases. These men work on a commission, or a salary and commission, basis.

Contracts for the supply of mineral lubricants to the railroad and tramway companies are generally made with the successful bidder for this trade. Sealed bids are requested for quantities that must follow the desired specifications, the tenders being handled precisely as they would be in this country.

Lubricating oils and greases intended for the mills, factories, and transportation lines are imported in 50-gallon wooden barrels. The locally made brands are packed either in wooden barrels or steel drums. Lubricating oil for the motor trade is handled in tins from 1 to 5 gallons in size, while greases appear in packages up to 50 pounds each.

The Royal Dutch lubricating products are sold under the trade or brand name of D.P.M.—the initials of the Dordtsche Petroleum Maatschappij, the marketing company of the group. The American brands are most in demand, except where price and not quality is the main consideration.

Marketing Conditions

IMPORTING AND DISTRIBUTION POINTS

Outside of the refineries already described, the several ports are the large distributing centres. In order of gallonage imported, the more important of these are Poeloe Samboe, Batavia, Soerabaya, Semarang, and Makassar.

On Poeloe Samboe, a small Dutch island of the Riouw Archipelago, within 7 miles of Singapore, the Bataafsche Petroleum Maatschappij maintains a very important storage and distributing centre. Surplus oil from the Pangkalan Brandan refinery is shipped here for storage and reshipment to other points. This place is also an importing station for kerosene, benzine, gasoline, and fuel oil from British Borneo and Persia. A fuel-oil bunkering station with a 63,000-barrel capacity is located there in addition to the other storage facilities. On Poeloe Bukom, another small Dutch island in this group, there is additional storage as well as a fuel-oil bunkering station. The imports received at Poeloe Samboe in 1921 were 4,800,000 gallons of kerosene, most of it from Persia;

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* Occasionally Europeans, Arabs, or natives are made agents when local conditions warrants such an appointment.

3,600,000 gallons of benzine and gasoline from British Borneo; 6,100,000 gallons of fuel oil, largely from British Borneo; besides smaller quantities of lubricating oil, grease, and turpine, a mineral oil substitute for turpentine.

At Batavia, Java, the petroleum installations are located 10 miles distant, at Tandjong-Priok, the port of the city. Here both the Dutch and American companies maintain tankage and warehouses for package goods. One American company has a can factory and filling plant for the packing of imported kerosene. Distribution to the interior is principally by rail shipments over the government-owned railroad lines, though considerable quantities are moved to near-by points in oxcarts. Batavia (Tandjong-Priok) is the chief receiving port in Java for kerosene, lubricating oil, and grease. The quantities imported in 1921 were approximately 3,000,000 gallons of kerosene, 1,400,000 gallons of lubricating oil, and 15,000 pounds of lubricating grease, besides smaller quantities of other petroleum products. Practically all these shipments originated in America.

Soerabaya, known as the sugar port of Java, is the second largest importing centre for petroleum products. A new petroleum harbor has been completed there within the last few years. All facilities are available for alongside unloading of both bulk and package petroleum. The oil companies have acquired locations at the new harbor site, and have built extensive bulk tankage and case-goods warehouses. An American company has facilities here for can manufacturing and filling of imported bulk kerosene. Distribution to the interior is largely by freight cars over the government and Netherlands Indian railroads. Ox-carts, as well as flat-bottomed boats on the coast and the Brantas and Solo Rivers, do considerable freighting of kerosene to the smaller markets.

The imports at Soerabaya of petroleum products for 1921 were 1,200,000 gallons of kerosene, 1,500,000 gallons of lubricating oil, and 422,000 pounds of grease, besides smaller quantities of vaseline, candles, and asphalt, practically all these commodities coming from the United States.

Semarang, on the north-central coast of Java, is another important receiving port for mineral oils. The petroleum companies have large warehouses here for storage and the distribution of their products to this part of the island. Shipments to interior points are made over the N. I. S., a privately owned railway. The 1921 imports totaled 1,300,000 gallons of kerosene, 2,400,000 gallons of lubricating oil, 268,000 pounds of grease, and smaller quantities of ther petroleum derivatives, America being the principal source of supply.

Makassar, the chief port of Celebes, is the importing center for all the southern portion of that island, as well as for other small islands in the vicinity. There are extensive warehouses here for case goods, but no tankage except for fuel oil at the bunkering station maintained here by the Royal Dutch Co. All the distribution from this point, with the exception of some kerosene that reaches the nearby points in oxcarts, is by boat—either native prauws or steamers of the Koninklijke Paketvaart Maatschappij or the Nederlandsch Indische Tankboot Maatschappij. The quantities of petroleum products received during 1921 were 1,000,000 gallons of kerosene, 22,000 gallons of lubricating oil, and 64,000 pounds of grease, as well as small amounts of gasoline and benzine.

In addition to the larger places mentioned above, there are importing and distributing warehouses at Padang, Sibolga, Medan, and Sabang, in Sumatra. At Medan and Sabang there is tankage as well, the latter port being a small fuel-oil bunkering station. smaller importing points of Java are Indramajoe, Cheribon, Tegal, Pekalongan, Pasoeroean, and Panaroekan on the north coast, Banjoewanji on the eastern end of the island, and Tjilatjap on the south coast. Besides the usual warehouses, one of the oil companies, the Dordtsche Petroleum Maatschappij, has tankage and a filling plant for kerosene at Tjilatjap. The railraods are the chief means of distribution from all these places. Boeleleng, on the island of Bali, Menado and Gorontalo in Celebes, Tenate, Amboina, and Banda Neira in the Moluccas, and Pontianak and Bandjermasin in Borneo are also minor receiving and distributing points. Most of the oil is resnipped in small boats or steamers from these ports.

Principal Exporting Ports

In 1914 the Dutch East Indies exported 265,000,000 gallons of liquid products, in addition to 27,000,000 pounds of solids valued at a total of $55,000,000. Official figures for 1921, the latest available, show that this trade has increased steadily, the totals in this year being 473,000,000 gallons of liquids and 101,000,000 pounds of solids, representing a total value of $90,000,000.

The important exporting places are Balikpapan, Pangkalan, Brandan, and Palembang, where the larger Royal Dutch refineries are located. In addition to these, Tandjong Seilor, the port that clears the crude and fuel oil from the Tarakan field, and Poeloe Samboe, the storage installation near Singapore which handles the surplus of the Pangkalan Brandan refinery, are points that ship large quantities of petroleum.

During 1921, Tandjong Seilor exported more in volume or gallonage than any of the other ports, the quantity amounting to 170,000,000 gallons of crude and fuel oil; about hlf of this was credited to Japan, a country that buys large quantities of these oils from the Dutch Indies. Singapore and Hongkong also received large quantities from the same source.

During that year Balikpapan shipped 138,000,000 gallons of liquids in addition to 90,000,000 pounds of solids. The 23,000,000 gallons of kerosene exported from here went to Singapore for reshipment to the Straits Settlements and to China. Singapore and Gibralter received the larger share of the 53,000,000 gallons of benzine and gasoline shipped. Balikpapan fuel oil (59,000,000 gallons) is credited chiefly to Singapore, British Indiaz, Suez and Hongkong, in the order of the quantities received. Slightly less than 2,000,000 gallons of lubricating oil made at this Borneo refinery were sent to Singapore for further redistribution. All the paraffin and candles exported from the Dutch East Indies, with the exception of small amounts from the Tjepoe factory, are made and distributed from Balikpapan. The 1921 totals are 42,000,000 pounds of paraffin and 8,600,000 pounds of candles. Practically all of the paraffin was divided almost equally among Japan, China, and the United States, while China was the largest buyer of the candles.

In 1921 Poeloe Samboe, the Dutch storage installation off Singapore, was the third port from a gallonage or volume standpoint. The quantities cleared to foreign countries were 30,000,000 gallons of kerosene, 46,000,000 gallons of benzine and gasoline, 4,700,000 gallons of fuel oil, 470,000 gallons of lubricating oil, 323,000 pounds of grease, 180,000 pounds of candles, and 225 tons of asphalt. The larger share of these products was made in the refinery at Pangkalan Brandan, Sumatra, and sent to Poeloe Samboe for storage and redistribution.

Palembang is the fourth port in these islands for the export of petroleum products. In 1921 the refineries located there shipped the following quantities to foreign countries: Kerosene, 22,000,000 gallons; benzine and gasoline, 38,000,000 gallons; fuel oil, 2,000,000 gallons; lubricating oil, 660,000 gallons; grease, 389,000 pounds; and asphalt, 634 tons. The kerosene from here goes largely to Asiatic countries, the Straits Settlements, and China being the best markets. The exported gasoline, being of excellent quality, is in good demand in European countries.

The refinery at Pangkalan Brandan exports only kerosene, benzine, gasoline, and fuel oil. The 1921 figures are: Kerosene, 10,000,000 gallons; benzine and gasoline, 5,000,000 gallons; and fuel oil, 2,000,000 gallons.

All petroleum products shipped from the Dutch East Indies are subject to an export duty. They are divided into two classes and are rated as follows: (*a*) Kerosene and all by-products not mentioned under (*b*), 7.50 guilders per 1,000 kilos; (*b*) liquid fuel, residue, 4 solar oil, filter-press oil, lubricating oil, greases, batching oil, pitch, and wax oil, $1.50 guilders per 1,000 kilos.

In computing quantities, gasoline of 61° Baume gravity at 60° F. is taken as 37.9 cases or units of two 5-gallon tins to the metric ton of 2,204.6 pounds. Kerosene is taken as 65 pounds net per case or unit of two 5-gallon tins. Lubricating oil at 7½ pounds to the American gallon is taken as 294 gallons to the metric ton of 2,204.6 pounds.

Within the last year there has been a good deal of propaganda, especially on behalf of the Royal Dutch Co., to have the export tax on petroleum products removed, as this levy is considered burdensome and a restraint on the development of the export trade in petroleum. The Dutch colonial government cannot afford to do without the money derived in this way, so various plans have been proposed for the collecting of revenue from other sources, such as a refinery tax on petroleum products or an export tax on other commodities.

Sarawak Oil Fields

Paper Read by Hon. T. G. Cochrane, D.S.O., Before the Royal Society of Arts

THE production of petroleum in Sarawak in 1923 was about 560,000 tons, and though this is not large in comparison with, say, California or Mexico, it has this point of special interest and importance—that it is produced within the empire. The production from Sarawak for 1918 was 80,000 tons, making it a very bad fifth in the list of producing countries within the empire. To-day Sarawak can claim to be by no means a bad second—the lead, of course, still being held by the great oilfields of Burma, the work of many years of development. A series of more or less active seepages, located a little inland from the original Miri village, were exploited in a primitive way by the Miri Malays. The procedure was to dig pits about three feet deep in the zone of seepages. Being in swampy ground these pits filled with water on the surface of which the oil floated. This oil was skimmed off by the natives using gourds or cocoanut shells, and burnt for lighting their huts in very primitive lamps, made from any convenient vessel, such as an empty tin, a small gourd or even a bottle, using a strip of cotton or other cloth to serve as a wick. The bituminous residue or asphalt which was found at the seepages (the result of evaporation and oxidation) was also used by the natives for caulking their dugouts.

Pioneer Work

Between August and December, in the year 1909, Dr. Erb carried out a rapid reconnaissance survey in the northern part of Sarawak, coveing some 400-500 miles, and was able to report the existence at Miri of a dome-shaped, unsymmetrical anticline, with a steep eastern flank and numerous oil shows. As a result the Anglo-Saxon Petroleum Company made an application to the Rajah of Sarawak—the late Sir Charles Brooke, G.C.M.G.—for a concession to exploit the oil resources of Sarawak. The Rajah in due course granted to the company a concession on terms which were fair and satisfactory to both parties. In February, 1910, Dr. Erb returned to Miri, and after further investigation of that area, fixed the location of the first well, and in March Mr. McAlpine, who is still at Miri, went to superintend the boring.

At this time there was no accommodation available at Miri, and all hands set to work to build shelters for the Chinese coolies, the Malays being billeted on the natives. It is pleasant to record that these pioneers of a new industry in Sarawak had a most friendly reception from the natives, and were given every help and encouragement by the Sarawak government officials. The rig irons, boilers, engines and drilling tools were dispatched from the Sanga Sanga field in the Dutch East Indies in charge of Mr. Souter, an English driller, and arrived at Miri early in May. The site for the first well was located about a mile from the landing place, 260-ft. above sea-level. The drilling boiler took 80 men with blocks and tackle three days to haul into position. Drilling commenced on August 10, using the wire line and poles method, which had proved very successful in the Dutch East Indies. Exactly two months later, on October 10 oil was struck at a depth of 447-ft., and the well produced 4 tons of water-free oil per day. It was then deepened slightly to 510-ft., from which level it produced 12 tons a day. The success of the first well, of course, necessitated its being shut in until storage could be erected. A second well was commenced in April, 1911. In September, Mr. H. Wyndham-Jones, the first general manager, arrived and took charge of the operations. He remained at Miri until 1920, when he was able to hand over to the present general manager, Major E. V. Benjamin, M.C., a vastly larger and more important enterprise than he had found nine years previously. The first steel storage tank of 4,500 tons capacity was completed in October and the production for the year was about 260 tons. On April 18, 1913, the first shipment of Sarawak oil was made in two lighters, which were towed away from the Miri River. The experiment was also tried later on of mooring a tanker off the Miri River to act as a floating storage tank. This, however, was not altogether a success, as the weather often made it impossible for a tanker to go alongside, and lighters had still to be used. In 1914 further successful wells were drilled.

The War Handicap

At the beginning of 1915, as was to be expected—and, indeed, down to the end of 1919—operations at Miri were much handicapped by shortage of materials and staff, and to an even greater extent by shortage of shipping and storage. Under these abnormal circumstances an abnormal course had to be adopted. Distillate had to be produced; it was not wanted for war purposes, and the limited storage capacity was required for crude oil and liquid fuel. We have all heard, I suppose, how in pre-motor car days benzine, i.e., petrol, was regarded by oil producers as a dangerous and undesirable waste product at a refinery, and how in consequence it was burnt in huge quantities to get rid of it. The Sarawak distillate, however, did not share this fate, but instead, the novel plan, which originated in the fertile brain of the chairman of the company, was adopted of pumping it back again into the earth from which it had come. About 30,000 tons of distillate was pumped back, the pump pressure at times rising to over 100 pounds to the square inch. Later on, in 1919, when storage and shipping conditions had become more normal, these wells were pumped again, and I am pleased to say that it is estimated that about 14,000 tons of distillate was recovered in the form of a light crude. By the end of 1915 the condition of the 6-in. submarine pipe line had become so bad that it was decided to lay an 8-in. line at once.

Pipe Line Developments

The first 8-in. line was successfully launched in September, 1916. The length was 11,750-ft., giving a depth of water at the sea end of 28-ft. at low water spring tides. This line is still in use, and three further lines have since been laid.

It was, of course, obvious that sooner or later the refinery would have to be moved from Miri to Lutong, so as to be near the tank farm and sea-loading line, and the refinery was able to start up at Lutong in July, 1919.

The years 1919, 1920, 1921 were devoted mainly to what I may term the consolidation of the position already gained, and in building up the necessary resources in staff and materials to make possible the greatly increased production reached in 1922. Thus while 1919 showed an increase over the previous year of 13,000 tons, 1920 an increase of 60,000 tons, and 1921 an increase of 58,000 tons, the year 1922 was able to show the remarkable increase of 204,000 tons—more than twice the production for 1921. The year 1923 has again shown a very marked increase over 1922 of some 150,000 tons. Recent deep drilling to the south of the old field has given favorable results, so that a further extension of oil-bearing structure in that direction is anticipated. At Pujut a shallow field has been developed with wells from 300 to 400-ft. deep, which produce a natural fuel oil with no constituents boiling below 200 deg. C. This crude is pumped direct to fuel oil storage tanks, so that if the Lutong refinery was completely destroyed to-morrow a certain amount of fuel oil would still be available for naval or other purposes. To the south of the old Miri Field exploration wells drilled recently have given good results at over 2,000-ft., producing a crude oil with a higher percentage of light fractions than are obtained from other parts of the field.

Refinery at Lutong

The refinery at Lutong at present comprises two units working on the "Trumble" system of distilling oil by means of tubular stills, with a combined throughout per 24 hours of about 1,500 tons of crude oil, while a third Trumble unit is in course of erection. There is now a sufficient supply of gas from the field to enable the whole refinery to be run on gas instead of on fuel oil at night time, when the requirements of the field are low. The sea-loading lines at Lutong are the longest in the world.

In view of the larger size and consequently deeper draught of modern tank ships it was thought desirable to secure a depth of water at the loading terminal of not less than 35-ft. at low water. Soundings showed that to obtain this depth a length of about 14,500-ft. ($2\frac{3}{4}$ miles) would be required. The very great importance of making the most eleborate arrangements for control during the actual period of launching will be appreciated when it is remembered

(Continued on page 189).

The Fushun Oil Shale Deposits

300,000,000 Tons of Petroleum Awaiting Exploitation; S.M.R. Plans for a 2,000-Ton Extraction Plant to Cost Yen 6,000,000

As the consumption of kerosene increases annually, effort is being turned to finding some way to produce petroleum from outside an oil field or petroleum well. A solution of coal or its liquidizing is one of the means. A low temperature dry distillation of coal is another. Then, fish oil or bean oil is also subjected to dry distillation. Fourthly, oil shale is also put through dry distillation.

(1) The solution of coal and its liquidizing still belong to an experimental stage.

(2) The low temperature dry distillation of coal has nearly advanced to a stage bordering on an industrially workable one, but so long as the market for the gas and colite put out from this process has not been fully exploited, the production of oil in a large quantity will be out of the question. By (3) the dry distillation of fish oil or bean oil, petroleum may be obtained to the extent of about 60 per cent. Still, the fish oil outputs of Japan are only about 20,000 tons a year. As to bean oil, 900,000 koku or 150,000 tons may be put out in Manchuria. However, it has important uses as an edible and an industrial material, making it impossible to make fuel therefrom on an economical footing.

Only, manufacture of petroleum from oil shale dates back 70 years in Great Britain, France, and elsewhere. In England, as much as 2,000,000 *koku* of petroleum of the same quality as natural petroleum in every respect is obtained from this source.

Therefore, if petroleum is to be sought outside a natural oil field, the dry distillation of oil shale is the only way to produce it at present.

The United States puts out 70 per cent. of the world's petroleum. According to a report of the geological institute of America, the aggregate oil reserve left is placed at 9,100,000,000 barrels which is expected to last not more than 20 years hence. Colorado and Utah and elsewhere have been attracting investments by entreprising capitalists, and in ten years' time, the oil shale industry might occupy the place of importance, that is now filled by natural petroleum mining.

In France and Austria, too, oil shale industry has been carried on from early times, and in recent years, factories have come to be founded in Esthonia, Sweden, Canada, etc.

Since shale oil promises to supplant petroleum in the not distant future, the powers, while running after new petroleum fields, are almost engrossed in looking for oil shale mines.

To date no oil shale deposit has been discovered in Japan proper. However, the Fushun Collieries owned by the S.M.R. Co. hoard one of the richest reserves in the world. Moreover, the results of latest investigations show that the Fushun shale is equal to any foreign product in point of quality. Favored with advantageous local conditions, the Fushun deposit can be operated on a most economic basis in peace time.

Oil Shale at Fushun

The oil shale of the Fushun Collieries exists in a thick seam of about 4,000-ft. over the coal seam. Its total reserve is placed at 5,500,000,000 tons. By dry distilling the shale, 5.5 per cent. of crude petroleum on an average may be had. At this rate, the total oil amount contained in the shale seam reaches about 300,000,000 tons, that is, 1,900,000,000 barrels being about one-fifth of the aggregate petroleum reserve of the United States amounting to 9,100,000,000 barrels. On this basis of calculation, the Fushun shale oil alone will be sufficient to supply Japan with her total annual wants of 6,000,000 barrels in petroleum for as long as 300 years.

Fushun shale cannot be said to have a high oil percentage, but its peculiar advantages consist of firstly, its existence in an excessively thick seam directly above the coal seam, at only a comparatively short depth from the surface ground; secondly, exceptionally low labour wages; thirdly, availability of fuel coal in an unlimited quantity and at a cheap price; fourthly, comparative plenitude of communications facilities; fifthly, abundance of water for industrial use. All these peculiar advantages work together to ensure an economic success to the oil shale industry at Fushun.

The reserves of the oil shale at Fushun Collieries, according to the various depths from the surface ground, may be roughly estimated as follows:

Oil shale reserve	Tons
Down to 100-ft. (underground)	252,000
Down to 200-ft.	505,000
,, 300 ,,	756,000
,, 500 ,,	1,223,000
,, 1,100 ,,	2,380,000
,, 2,000 ,,	4,151,000
,, 3,000 ,,	4,932,000
,, 4,500 ,,	5,477,000

The total shale amount estimated to be mined from the execution of the extensive open cut mining plan, is put about 500,000,000 tons. By dry distilling the annual outputs of between 5,000,000 tons and 10,000,000 tons for 25 years, shale oil of 385,000 tons or 2,310,000 koku of shale oil on an average may be obtained, which will still be somewhat more than the total petroleum outputs of Japan.

Supposing that the oil shale should be mined on a 100 years' programme down to the depth of 2,000-ft. underground, in connection with the oil shale industry, some 2,000,000 tons of crude petroleum might be had from the average annual outputs of 40,000,000 tons of oil shale.

The recent petroleum demand in Japan being 1,000,000 tons a year, the Fushun shale oil by itself would satisfy the entire needs of Japan for scores of years, even if her annual consumption might be doubled, or trebled.

The S.M.R. Co. proposes to begin with the utilization of the oil shale to be mined in the open cut mining zone, and then to take to a gradual extension of the industry as occasion require with the object of making Fushun the central source of supply of solid and liquid fuels to Japan.

As regard the industrial assets of Fushun oil shale, such specialists as Messrs. T. Suzuki, G. Katayama, K. Saito, and M. Akita, all in the service of the S.M.R. Co. then, took up each a line of study, but none of them has succeeded in fully ascertaining the real assets. The imperial navy despatched a few chemists specially on a like errand, which has met with no better results.

There may have been divers reasons for their failure, but none of them seems to have observed the existence of a wide difference in quality of oil shale according to distances from the surface ground. They are believed to have gathered the specimens of shale from near the coal seam in the Pits.

As the open cut mining operations progressed, Mr. K. Akabane (now director of the S.M.R. Co. and the author of the present article), happened to meet Admiral Nagasato, director of the Munitions bureau of the imperial navy, and Vice-Minister Ide, of navy, in June, 1922. As a result of the interview, Mr. Akabane became strongly impressed with the importance of the independence of petroleum supply for Japan, and suggested the organization of a commission for the study of Fushun oil shale. The investigation was pushed forward steadily. About a dozen diamond borings were executed in the open cut zone, Fushun, and as an upshot, the oil percentage contained in the shale has been adcertained to be promising. This has made sure of the economic workability of treating shale put out from the open cut zone, but there still remains the question whether shale output by underground mining will pass the test with as excellent an outcome. It is to solve this remaining question that 500 tons of oil shale has been shipped to Scotland, with two experts specially commissioned to take part in the experiments in Scotland.

However, for treating Fushun oil shale on an industrial scale, the results of the experiments carried on by the S.M.R. Co. central laboratory, using (1) Scotch dry distillation method, (2) naval fuel depôt dry distillation method, (3) Swedish producing plant and (4) naval fuel depôt producing plant), have demonstrated the superiority of the Scotch process. Three kinds of shale specimens, each 30-lb., were forwarded over to Scotland, and the reports sent in have established beyond question the industrial merit of the shale.

The results obtained may be summarized as under:

	Average
Oil obtained from 1 ton shale	12.21 gallon
Sulphate of ammonia from the iron shale	50.58 lbs.

Report Prepared in December, 1923

		Gallon	lbs.
Shale sample	"A"	22.00	61.30
	"B"	13.63	53.22
	"C"	8.99	56.83

Supposing that a new dry distillation and oil extracting plant on the Scotch system should be founded at Fushun, the expense and receipt accounts might be roughly estimated as follow:

Scale of Plant

700,000 tons of shale to be treated for 350 days in the year, at the rate of 2,000 tons per day.

Plant Construction Costs

Dry distillation plant	Y.3,600,000
Oil plant	1,500,000
Office, godowns, reserve fund, etc.	900,000
Total	Y.6,000,000

Treatment Cost Per Ton Shale

Dry distillation costs	Y.1.42
Oil extracting costs	1.83
Manufacture of sulphate of ammonia	0.89
Disposal of residue shale	0.40
Total	Y.4.54

Outputs and value thereof from per ton shale (containing 8 per cent. oil to be extracted), delivered at the plant, Fushun,

	Gallon	Gallon	Value
Gasoline put out	1.53	@ Y.0.60	Y.0.900
Fuel	4.22	0.20	0.844
Gas and lighting oil	5.58	0.09	0.500
Lubricating oil	1.54	0.30	0.462
	lbs.		
Paraffin wax	0.20	0.07	1.400
Sulphate of ammonia	0.40	0.0535	2.140
Total value of outputs			Y.6.246

(Gas and fuel oil at Y.20 per ton and sulphate of ammonia at Y.120 per ton).

The total value of the outputs being put at Y.6.246, and the total cost of production at Y.4.540, the balance of Y.1.696 will represent the profit to be cleared from the treatment of every ton of oil shale. At the rate of 2,000 tons a day, the total annual amount to be dealt with will be 700,000 tons, bringing in the total profit of Y.1,187,200. From this profit may be deducted the sum of Y.300,000 for depreciation of the machinery and other equipment, together with the office expenses. In addition, the sum of Y.98,000 may be subtracted as the balance between the mining costs and the assets of the residue shale as a filling-up material, as mentioned later on. Thus, taking off the sum of Y.400,000, still the net profit of Y.787,000 will be left, which will give an income of slightly over 13 per cent. to the capital amount of Y.6,000,000, invested.

The above calculation is based upon the returns obtained from the above mentioned experiments. What actual returns will be given by the large scaled experiment to be carried on in Scotland may be available for publication in about June next. Supposing, for argument's sake, the oil shale industry should fail to be made into a paying venture, still Japan would be in a position to establish a national policy for supplying her own petroleum. This, in itself, will be a matter for congratulation as a provision against emergency.

The United States will export kerosene for the use of the Japanese warships and merchantmen. However, petroleum is subject to embargo in war-time as contraband. It would be the height of thoughtlessness to be contented with the present situation, and to give no thought to an inflated demand from the men-of-war in time of war.

Even allowing that the working of the oil shale industry on a factory scale should turn out an economic failure, the central government ought to be prevailed upon to extend suitable protection and support to this industry.

Again, in case of the same industry proving an economic success, fuel may be supplied at Dairen wharves to oil-driven craft, which contingency will be to the S.M.R. Co. a thing of too much significance to be passed over.

Next, the open cut mining at Fushun collieries can not be carried on without the preliminary stripping and necessary incidental costs, put together, will amount to only about half the costs for underground mining. Thus, the shale having to be stripped off in the order of things, no special price need be attached thereto However, if considered independently, the shale mining cost, inclusive of the transportation cost to the dumping ground and the interest on the incidental costs, etc., are estimated at not more than 25 sen per ton. Now when the residue shale is to be substituted for sand now flushed into the pits, as a filling-up material, the residue will be worth 16 sen per ton in the flushing sand pockets. Now, 70 per cent. thereof consisting of the shale residue, the management will have the gratification to lay out only 12 sen per ton, instead of about 50 sen per ton of sand hitherto in use. This will make a world of difference in favor of the management.

Sarawak Oil Fields

(Continued from page 187).

that, while the construction and preparation of the runway and pipe line take many months, the actual towing out of the line may take less than an hour. A towing hawser some 6,000-ft. long was secured to the eye at the end of the pipe line, and laid out by launches and barges until a depth of water was reached at which it could be hauled on board a tug, which with a tanker, had come as close in shore as possible. On a signal from the shore being given the tug and tanker commenced steaming ahead on a course marked with buoys. Once the line was started it moved evenly forward at an average rate of 3.17 knots, no derailments occurred, and the stop signal was only hoisted when some 14,500-ft. of line had been successfully launched. To complete the submarine line for service 120-ft. of flexible hose 8-in. diameter in 20-ft. lengths is coupled to the sea end of the line by a diver and the other end attached to a buoy. In spite of the great length of the submarine lines and the exposed position of the sea leading station in certain winds, their operation has been very successful, and during 1923 115 ships were loaded or bunkered without any mishaps or serious delays.

From the figures which I have given of production it will be appreciated that a large staff both of Europeans and of Asiatics is required. At the end of 1923 there were 133 European employees with 42 ladies and 39 children. Also 190 senior Asiatic staff and 3,252 coolies. Miri itself has long ceased to be a primitive native village, and now possesses motor roads, railways, electric-light, an automatic telephone exchange, far in advance of anything provided by the post office in London, clubs for European and Asiatic staff, a soda water and ice-plant, a farm producing milk, eggs, beef, mutton, etc., a cinema, a school for European children and another for Asiatic children, a church, a golf course, and cricket, football and baseball grounds. The company also operates a large sawmill on the Bakong river, a tributary of the Baram river, which produces large quantities of timber both for building purposes and for the construction of drilling rigs.

Pullman Express Train on the Chinese Eastern Railway

The Chinese Eastern Railway

Notes on its Working Results

AS a result of the economic crisis following the war and the Russian revolution, the Chinese eastern railway was transformed from a trans-continental trade artery connecting Europe with the Pacific to a purely local line relying for its existence upon the export of Manchuria cereals and a limited importation of general cargo for the requirements of its own zone. Before the revolution the line enjoyed a liberal subsidy and support from the Russian government who also directed its economic policy. With the advent of the Soviet *regime* it was thrown entirely on its own resources and was forced to devise a new operating program and adjust itself to changed conditions.

In a recent report of Mr. Ostroumoff, he says that during 1920, the year previous to his taking over the management, new industrial enterprises sprang up in the railway zone, trade and industry flourished and commercial transactions increased, all of which was reflected in the volume of freight handled by the line. This activity, however, was a direct result of the fall in the value of the rouble causing commodity prices to soar to unheard of levels. Exchange was favorable and fortunes were made in a day. Bills of lading issued by the railway passed through many hands. The boom attracted an ever increasing number of buyers and wild speculation was the order of the day. The higher the railway raised its freight rates, the public refused to be alarmed, for although the rates were quoted in gold roubles they collected in Romanoff, Kerensky and Siberian bank notes which gradually lost their value. This fever of speculation was also taken advantage of by many to unload their hoards of paper money.

When the bottom fell out of the rouble in 1920 and the railway insisted on hard currency in payment for frieght, a financial catastrophe followed. Bankruptcies were common. Millionaires became beggars overnight. The evil effects of this year are felt even to the present time. This occurred just prior to the change in the management of the road, which took place in February, 1921.

The business of the line was in chaotic condition. The employees had lost all sense of discipline, duty and responsibility. The line was being operated only on the Harbin-Changchun branch, the traffic towards Vladivostok being almost nil, as only 3,000,000 poods of freight had been transported in this direction during 1920, an average of 10 cars a day. There was no communication westward towards Manchuli. Through communications with the Chinese and South Manchuria railways had ceased. Trains were operated with great delays. The cars were dirty, neglected and lacking in even elementary comforts. There was only one train with decent rolling stock.

The goods rolling stock could not meet the heavy demands. The number of cars per train were small, speed was impossible, so the inevitable Chinese cart captured the business. During 1920, 60,000,000 poods of freight were carted from the C. E. zone to Changchun, or about 55 per cent. of the total grain production of the country.

The number of engines was inadequate. Repairs were made without reference to cost. Trains were frequently disconnected by the breaking of couplers. Hot boxes and blazing axles were a constant occurrence. The costs of fuel and lubrication were excessive. The railway administration was completely cut off from contact with the line, which was operated by the employees without system, routine or accounting.

Maintenance was expensive and carried on without any regard for the administration. Buildings and other structures had not been repaired or painted for years, while those which had been destroyed or damaged by fire were never rebuilt. All buildings, those in Harbin included, were indescribably filthy and required extensive repairs. The road houses were in a deplorable condition.

The inability of the railway to meet the traffic requirements during 1919 and 1920 resulted in the accumulation of huge masses of cargo at all stations. Shippers had the greatest difficulty in obtaining cars or space. To meet this situation the railway employees put into practice the plan of selling cars, and even whole trains to shippers at excessive rates in hard currency, which sums were not turned into the administration offices. Great sums were lost to the railway through this practice, as to date no satisfactory audit is possible.

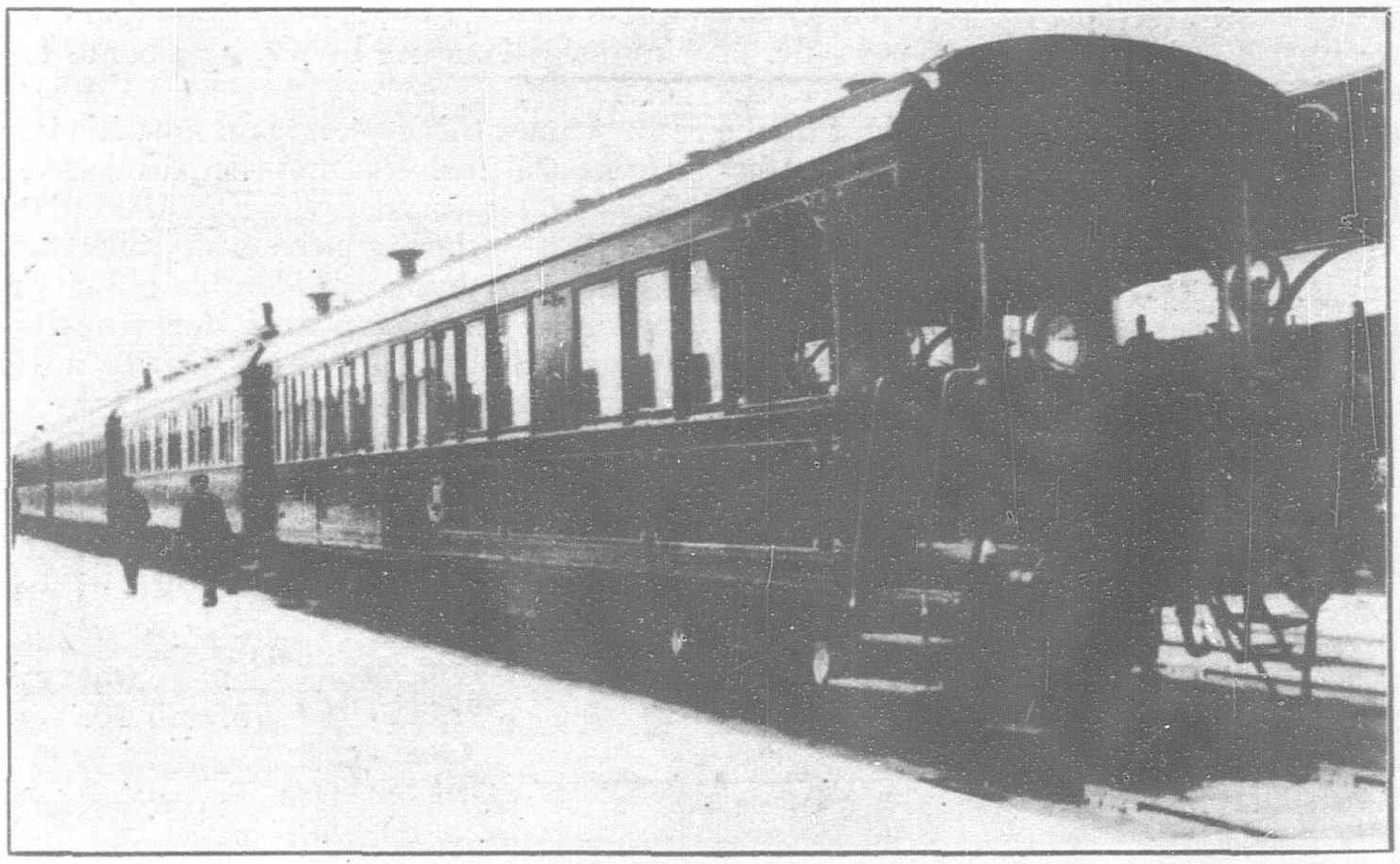
Materials were purchased against hard cash, and at an exchange most unfavorable for the railway. Firewood reached 55-58 gold roubles per cubic sagen (about $11 gold per cord) while coal from the railway's own mines at Djalainor cost 35 gold copecks per pood (or over $11.00 gold a ton). Free competition in tendering for supplies was waived and the railway became the prey of a contractor's monopoly which fixed its own prices for commodities.

When the railway enforced the payment of rates in gold roubles in December, 1920, the traffic fell to 2,565,700 poods. In January, 1921, this increased to 3,856,382 poods and in February to 4,381,975 poods. In one year or by December, 1921, 12,081,211 poods were carried: 9,383,373 poods in January, 1922 and 5,658,848 in February.

It was obvious from these figures that freight rates had been maintained at too high a level and that a continuance of such rates would lead to suspension of traffic. A reduction in rates was therefore made in March 1921, which resulted during the year of raising the total volume of traffic to 127,000,000 poods, of which over 26,000,000 were consigned to Vladivostok. In 1922, the line carried, 152 million poods (50 per cent. more than in 1921) of which 37,000,000 poods went to Vladivostok. The first half of 1923, showed 98,500,000 poods of which over 28 million went to Vladivostok. With the reduction in freight rates, the administration undertook to decrease the operating expenses which in 1920 amounted to 47,019,208 roubles. In 1921 this was reduced to 32,420,216 roubles, in 1922 to 27,500,000 roubles, while in 1923 it was expected to bring it under 26,000,000 roubles.

The report of 1921 shows that after allowing for all the vagaries of exchange, the net operating income was equal to 7,365,460 gold roubles against 6,400,702 gold roubles for 1913-14. In 1922 it was 9,030,000 roubles and for the first half of 1923, 5,182,836 roubles. In comparing these working results, Mr. Ostroumoff says that the line under his management enjoyed a prosperity equal to if not greater than its pre-war days, despite all economic and political problems, lack of through cargo and other drawbacks. In other words, it proved its value as a purely local line dependent upon the districts served for its business, all of which he declares, is due entirely to his policy of reducing freight rates. When he took over the management of the line in 1921, the first problem was to open the line for exports to Vladivostok, at which port the C. E. R. owns the splendidly equipped Egersheld wharves, and in the course of the year the results above-mentioned were obtained, while goods traffic on the western section was resumed in a small way.

Mr. Ostroumoff dwells on the various problems confronting the C.E.R. in its relation to the S.M.R. The Japanese line for a long time protected the native cart traffic which brought the produce of northern Manchuria to its Changchun terminus, thus depriving the Harbin-Changchun branch of the C.E.R. of much valuable traffic. After several conferences an agreement between the two lines was arrived at by establishing the principle of equal tariff rates for grain shipped over the Southern C. E. line to Dairen and from the same line to Vladivostok. This, however, did not materially change the situation for the C.E.R. for the reason that the trade of the district served by its Harbin-Changchun branch gravitates naturally towards Dairen. However, grain exports via Vladivostok increased under the agreement from 23.4 million poods in 1921 to 33.4 million poods in 1922 and 26.6 million during the first half of 1923. This was due to the increasing quantities shipped direct from Harbin to Vladivostok without change of gauge and breaking of cargo as is necessary in transhipping at Changchun.



Observation Car on Express Train of the C.E.R.

Any great increase in these through Vladivostok shipments are however hindered by the capacity of the Ussuri railway between Programchnaya and Nikolsk on which not more than 15 trains per day can be operated, due to the exceptionally heavy grades and the limitation of sidings too short to accommodate a full freight train. Another drawback to the profitable operation of the eastern section, is an almost complete absence of import cargo, which compels the return of full rains of empties doubling the operating expenses on the outward shipments.

Working agreements have also been entered into with the Chita section of the Trans-Siberian railway, while the Ussuri railway administration agreed to take part in a direct oversea traffic arrangements to be made with the Robert Dollar Company of America.

Aside from the urgent necessity of reducing the freight rates, Mr. Ostroumoff was faced with the working out of a complete new economic program for the development of the railway and the districts served. Before the Russian revolution when the line was directed from Moscow, its guiding policy was to facilitate through Trans-Siberian shipments. The development of its local traffic was subordinated to the larger interests of Russian trade. In order to draw up a comprehensive program for the development of its own business, an economic bureau was created to gather trade and industrial statistics and its investigations have been published in one large volume, which will shortly appear in English.

A new policy was established in working out tariff schedules, in which many problems have been considered. It was necessary to devise rates that would permit the railway to compete with the cart traffic, especially in the Harbin-Changchun zone. It was also decided to support and protect local milling industries, to build grain elevators and provide for the mixed storage of beans and bean oil, to encourage exports via Vladivostok and attract imports through the same port by conceding advantages in freight rates. Although a definite program has not been worked out, the preliminary measures taken to develop the line have increased the traffic from 102,286,613 poods in 1920 to 151,605,464 poods in 1922 and 98,500,000 in the first six months of 1923, or nearly a hundred per cent. increase in three years. The amount of produce hauled out of the district by carts decreased from 62,000,000 poods in 1921 to 13,000,000 in 1922.

In 1921, bean oil was transported for the first time in tank cars equipped with a heating apparatus for the winter months, while at the Egersheld wharves at Vladivostok special storage tanks were erected from whence the oil is pumped directly into the steamer's tanks. In 1922, the C.E.R. special grain conveyors were being installed at the Egersheld wharves for unloading grain from the cars into storage godowns and from there to the steamers. The expropriation of the wharf by the Soviet authorities have prevented the completion of this much necesasry improvement.

Prices of fuel have been reduced from 58 gold roubles in 1920 to 36 gold roubles in 1922 while coal which cost 33 copecks per pood in 1920 was purchased in 1922 at 12 to 13 copecks. The consumption of firewood and coal was greatly reduced in two years resulting in a saving to the railway of nearly 11,000,000 gold roubles.

Traffic Department

The disorganization of the freight service created an enormous congestion of traffic which called for a radical improvement in the traffic department. By the end of 1923 the speed of passenger trains had been increased from 65 to 77 versts per hour for the southern line and from 50 to 77 versts on the main line, a saving of 14 hours in the running time between Pognanitchnaya and Manchuli. Pullman cars for the three classes equipped with sleeping berths and electric lights have been placed in operation on the mail trains, with a buffet and observation car attached during the summer months. For the expected resumption of through service with Moscow two sets of express trains made up exclusively of Pullman cars are in readiness, while a special "train de luxe" composed of baggage, dining, two first class and a saloon car, supervised by the International Sleeping Car Company is available for private parties. Special two axle private cars are also available for passengers.

A great improvement was also made in the freight service and now averages 18 versts per hour as against 12 versts in 1920. Nineteen sets of large sized American freight cars with automatic brakes have been acquired and the length and weight of trains considerably increased. On some of the sections, freight trains of 70 cars weighing up to 100,000 poods are now operating against a former train of

60 cars weighing 65,000 poods. Decapod engines on other sections are now hauling trains weighing 80,000 poods on other sections where formerly the maximum weight was 65,000 poods. The average train load in 1920 was 16,162 poods and in 1923 over 30,000 poods. In 1920, the railway was using 9,621 cars, with an average of 713 cars loaded per day. In 1922 only 7,572 cars were in use with an average of 784 cars per day. This has permitted the railway to accumulate a large surplus of rolling stock, repaired and in good order for instant use. Considerable improvements have been effected in loading and unloading cars and the losses from claims on damaged or lost goods dropped from 63,000 roubles in 1920 to 26,996 roubles in 1922. The stations have been repaired and comfortable quarters provided for employees and traveling agents.

Though the number of pood-versts has increased the number of employees has been diminished and a reduction on operating expenses achieved. The number of pood-versts in 1920 was 4,116,710,000, with a staff of 3,482 and operating expenses of 398,445 roubles. In 1923, the number of pood-versts was 5,544,013,000, with a staff of 2,317 and expenses of 225,659 roubles.

Rolling Stock

In 1920 the expenses of the locomotive department accounted for 50 per cent. of the railway budget. This was reduced by 1922 to 41 per cent. The number of effective engines was 536, of seven different types, of which 36 per cent. were laid up for repairs. By 1923, the number of engines in bad order was only 17 per cent. of the total. A regrouping of the locomotives on the different sections utilizing their fuel tractive power and increasing the weight of the trains, effected a great reduction in the number in operation. During the export seasons of 1921-22, 281 engines were in service while in 1923 only 181. Up to August 1923, the railway had 110 engines in service with 333 in good order in reserve.

The railway has a total of 610 passenger cars of which half were unfit for service in 1920. At present, about 26 per cent. are unserviceable, with 249 cars in operation and 186 in reserve.

In regard to freight cars, the C.E.R. comes under the general direction of the Russian state railways and does not possess its independent rolling stock, being obliged to use those of the Russian lines. The interchange of cars is effected at Pogranichnaya, car for car, under a special reciprocal agreement. The freight rolling stock of the C.E.R. is therefore not permanent, but partly interchangeable, which leads to difficulties in their upkeep. The total number of effective cars is about 12,000 of which 9,562 belong to the C.E.R. This number is made up of standard Russian Cars with a carrying capacity of 750, 900 and 1,000 poods; American 2-axle cars of 1,200 poods, 4-axle cars of 2,700 poods and gondolas of 3,000 poods. A regrouping of these cars on the various sections has increased the axle load, decreased the number of train cars and the number of trains.

Fuel

The locomotive department consumed about 70 per cent. of all fuel purchased for the line. In 1920, the cost of fuel was 12,000,000 roubles while in 1923 it was reduced to 3,000,000 roubles. This great saving was effected by a lowering of price and a decrease in consumption per unit of work. This was brought about by regrouping of engines; increase of weight of trains to full utilization of tractive power; regrouping of cars: installation of arches and arch tubes on engines; use of firewood and coal in a proportion based on investigations and by paying a bonus to the engineers for practicing economy.

Under this system, and notwithstanding the increased speed of trains the fuel consumption decreased from 0.834 cu. sagens per 1,000,000 gross pood-versts in 1920 to 0.508 in 1923, or 38 per cent.

With other improvements inaugurated in the shops and road houses and by a considerable reduction in personel, the total expenses of the rolling stock department was reduced from 23,705,000 roubles in 1920 to 9,605,000 in 1922, with 5,046,000 for the first seven months of 1923.

The Day of the Automatic Telephone

(Continued from page 166).

by the beginning of next year. Telephone apparatus for these central offices already has been ordered from America and several Japanese concerns, but the order was so large that the goods will not be received until September. At any rate, we are planning to install the automatic telephones as soon as possible."

A Typical Tokyo Exchange

Before the earthquake Tokyo had 110,000 telephones which were subscribed to by 82,000 persons. As a result of the destruction of 16 telephone offices by the quake, the number of subscribers was reduced to 18,000. In addition to this the long-distance call station situated in the Marunouchi was destroyed completely.

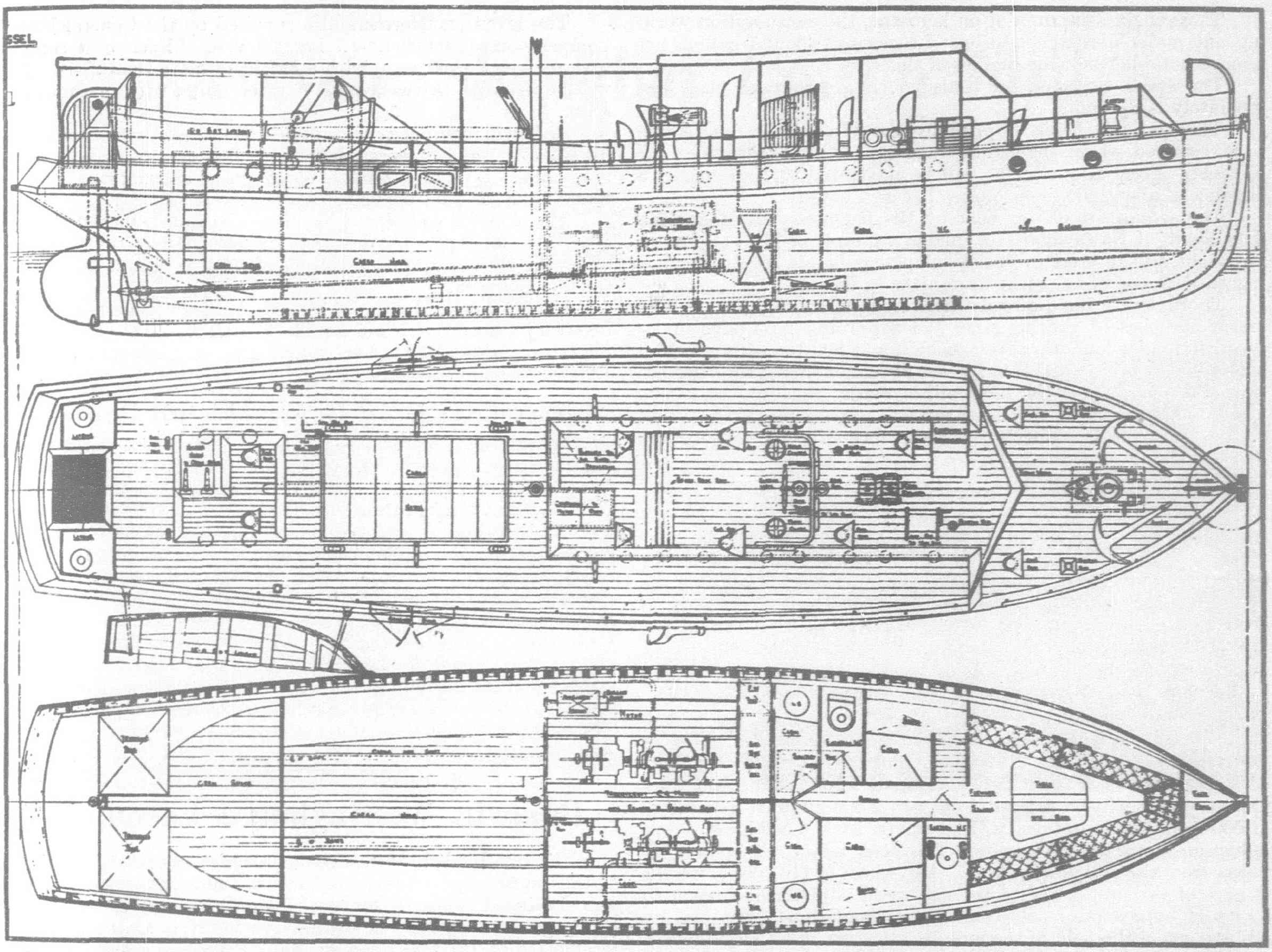
The authorities, however, made a desperate effort to establish communication with other parts of the country immediately following the quake and succeeded in the attempt on the sixth day after the earthquake by using old and imperfect apparatus. In the meantime, work of restoring telephone service in Tokyo had been rushed, and by September 5 about 200 telephones connecting the imperial household department and government buildings were restored.

Equipment in the four central offices which escaped fire was damaged by the earthquake. They have been gradually, however, repaired and by September 29 were completely perfected. The long-distance telephone station was not restored completely until December 1. The telephone exchanges now operating are Aoyama, Takanawa, Koishikawa, and Ushigome, all of which are situated uptown. Mr. Shimmyo reports that the Marunouchi centre will be opened on February 10 and the Yotsuya centre March 10.

Special Service Installed

As a measure to meet the immediate need pending the installation of the automatic telephone service, the telephone bureau has been establishing the so-called special telephone service which is somewhat similar to the private exchange in the American telephone system. About 200 subscribers living within three *cho* of a telephone centre who are urgently in need of a telephone service may make an application for the establishment of a sub-centre. The establishment of the sub-centre costs about Y.300 for each subscriber and is to be operated at the expense of the telephone bureau. Thirteen sub-centres already have been established and 65 are authorized. The subscribers are charged the pre-quake rate for this service.

Another emergency measure is the introduction of an improved system of booth telephones, similar to those operating in large railway stations in America. This telephone station is operated by a regular telephone operator with a number of messenger boys. These messenger boys will carry a telephone call anywhere within five *cho* of the place where the station is situated at a charge of 10 sen per call. Fifteen stations of this kind have been established, some of which are situated at the Marunouchi building, stock exchange building, the Ginza and near Kyobashi, and 50 are authorized. Besides these emergency measures the bureau is planning to establish at least 500 public telephones in various sections of the city.



THORNYCROFT PASSENGER AND CARGO VESSEL FOR
H.H. THE MAHARAJAN JAMB SAHE OF NAWANAGAR,
G.B.E., K.C.S.I. (RANJITSINHJI)
NAWANAGAR—CUTCH SERVICE

FITTED WITH THORNYCROFT C/4 TYPE ENGINES
AND REDUCING-REVERSING GEAR
POWER: 100 b.h.p. SPEED (Approx.) 8½ kts.
DESIGNED AND CONSTRUCTED BY
JOHN I. THORNYCROFT & Co., LIMITED

Passenger and Cargo Boat for Ranjitsinhji

THE launch took place on Thursday, November 29, of the very interesting motor boat *Halari* which has been ordered for his state by His Highness The Maharajah Jam Sahib of Nawanagar, G.B.E., K.C.S.I. (so well known as Ranjitsinhji).

She has been constructed by Thornycrofts at their Hampton Launch Works, Hampton-on-Thames, under Lloyd's survey for passenger and cargo work across the Gulf of Cutch from Jamangar to the ports in the state of H. H. The Maharajah of Cutch.

This service, which is rather more than the distance between Dover and Calais, is to be maintained throughout the year, including monsoons; and the boat has, consequently been very carefully designed and constructed to withstand not only the heavy weather incidental to the monsoon season, but also the extreme heat which is the condition during all but a short period of the year.

The hull is constructed on Thornycroft's system with teak planking, heavily copper sheathed to well above waterline, the timbers being very closely spaced with grown floors, reinforced with iron throughout.

The accommodation has been specially designed for the service, to provide comfort for all the classes of passengers who will be using the vessel. The total passenger capacity is about 140 persons. A first class cabin is arranged forward with cushioned seats, table and usual saloon accessories. From this space access is available to four separate single berth saloons with separate Eastern and European lavatories.

A hold is aft of engine space, with derrick, etc., for handling about 20 tons of cargo expeditiously. The hold is also so arranged as to be converted to third-class passenger accommodation in monsoon weather.

The steering position is amidships with reverse controls alongside wheel, and a double awning with side curtains is provided all fore and aft.

The dimensions of the *Halari* are :—

Length O. A.	74′ 0″
Beam O. P.	16′ 0″
Depth mld	7′ 3″
Draft	5′ 0″

After considerable deliberation and comparison with the results already obtained with a number of other types of engines, the Thornycroft C/4 type 50 b.h.p. engine with reducing reversing gear has been adopted, from the point of view of comfort to passengers, small space occupied, the high propulsive efficiency and economy in fuel.

These engines are running on kerosene, the consumption working out under normal conditions of service at about 7 gallons per hour, a notable result for engines of this size.

The speed expected on trials which are to take place immediately is 8½ knots.

The vessel is being shipped by the White Star liner *Runio* to Birkenhead where she will be transhipped to the *Circassian* for Karachi. From Karachi, she will be navigated to Nawanagar, a distance of about 400 miles, under her own power.

The acquisition of this boat by His Highness The Maharajah Jam Sahib of Nawanagar is a further example of his well-known fore-sight and interest in the development of his state, which is regarded as one of the most up-to-date in India.

Thornycrofts have already delivered to his highness several motor launches of varying sizes and types and now have under construction for him other craft including an 800-ton cargo steamer with which it is intended that further developments in the distribution of the produce of the state will be made.

For his highness's personal service, a most interesting yacht of the Thornycroft sailing motor yacht class is now well underway at their Hampton yard.

General Electric Notes

THE Tata Steel & Iron Company in India are installing at Jamshedpur a 6,300 horse-power motor, built by the General Electric Company, U.S.A., to be used to drive a combination rail and structural mill which they will operate there. This motor weighs 476,000-lb., has two armatures and one shaft. Its overall length is 25-ft., its width, 15-ft. and height, 12-ft. 8-in.

This mill motor has a capacity equal to turning out enough 85-pound rails in one hour to lay a two-rail track for 1.5 miles, or 200 tons of rails per hour. It is in two units, with armatures mounted on the same shaft, each unit developing 3,150 horse-power. Its motive power will be derived from two 2,500 kilowatt generators at 600 volts which, in turn, will be driven by a 6,500 horse-power induction motor at 3,000 volts. The latter motor will receive its power from the mill power plant. A flywheel of 110,000-lb. weight is part of the unit. The motor has speed adjustment from 0 to 80 r.p.m. by generator field control and from 80 to 120 r.p.m. by adjustment of the field of the motor.

Owen D. Young, chairman of the board of directors of the General Electric Company and recently selected as a member from the United States of the reparations committee to help balance the German budget and stabilize the mark, sailed for Europe from New York, December 29. Two Americans were invited to serve, the other being general Charles G. Dawes, former director of the United States budget.

Mr. Young started life on a farm at Van Hornesville, N. Y. He managed to secure an education at St. Lawrence University and later studied law in Boston, where he rose rapidly in this profession. In 1913 he became vice-president and general counsel of the General Electric Company, and, in 1922, was appointed chairman of the board, when he was but 48 years of age. He is also chairman of the board of directors of the Radio Corporation of America.

Apparatus Weighing 320 Tons is Shipped from America to Japan

Two 25,000-kv-a., 11,000-volt, 600-r.p.m., 60-cycle synchronous condensers, the largest over built for foreign shipment by the General Electric Company, U. S. A., have just been shipped to Japan. These condensers with transformers and control equipment were ordered by the Nippon Electric Power Company for installation in Osaka, the industrial centre of Japan.

These condensers will be used for power-factor correction on 154,000-volt transmission lines which serve a large area of Japan. They will also be utilized to control voltage and supply charging current losses in the line. The continuous rating is 25,000 kv-a: at zero power-factor leading and 22,750 kv-a. zero power-factor lagging. The total net weight of each condenser, including direct connected exciter and starting motor, is about 160 tons, with a shipping weight of approximately 185 tons.

The rotor alone weighs 70 tons. The poles were removed before shipment in order to reduce the weight. The stator or armature was shipped in two sections, the whole weighing 54 tons.

The seven transformers also supplied by the General Electric Company were 10,000 kv-a., 140,000 volts. Each unit complete with oil weighed 50 tons, with a height of more than 27-ft. They will be installed in two banks of three units, with one unit as a spare.

Although equipped with direct connected induction motors for starting, the condensers have been designed to start from the low voltage taps of a bank of single-phase transformers, thereby functioning for the time being as an induction motor.

The control equipment is of the semi-automatic magnetic type, and was specially designed for accelerating the condensers under the various torque conditions of running light, synchronizing the line charging.

Three additional units of similar character, together with the necessary transformers and auxiliary equipment, are also planned for future installation. This would give an ultimate capacity of 125,000 kv-a., in one station.

Japan Places Order for Giant Electric Generator

Schenectady, March 2.—The largest single unit turbine generator ever sold for export has been ordered from the International General Electric Power Company of Japan.

This G-E Curtis turbine has a capacity of 50,000 horse-power and will drive a generator which will supply 35,000 kilowatts of electric current at 11,000 volts, enough to light 1,000,000 of the average Japanese homes. With the exception of the rotor, the machine will be disassembled for shipment. The revolving field of the generator, which is 27-ft. long and 4-ft. in diameter, will be made from a single forging and will weigh about fifty tons. This will turn at a speed of 18,000 revolutions per minute.

This order, including accessories and switchboard equipment, represents an initial capital expenditure of more than $1,000,000. The new unit will be located in the city of Nagoya.

Baldwin Westinghouse Locomotive

The two Baldwin-Westinghouse electric locomotives furnished to the Japanese government railways are now in service near Tokyo. Designed primarily for local freight service over lines having heavy grades they may be operated in multiple as a road freight locomotive of 121 tons dead weight. Following are the principal dimensions of the two locomotives : Weight, 120,950-lb. : Weight per driving axle, 30,240-lb. : Diameter of wheels, 49-in. : Rigid wheel base, 9-ft. 1-in. : Total wheel base, 29-ft. 4-in. : Maximum speed, 40 m.p.h. : Starting tractive effect, 30,240-lb.

Two axle hung motors, inside hung and direct geared to the axle, are carried on each truck. These locomotives will be given close supervision while in service with a view to the acquisition of data concerning actual traffic requirements as well as of operation before determining the extent of the general electrification and the type of equipment on the government lines.

In addition to the locomotives supplied by the Baldwin-Westinghouse companies to the government railways several are in operation on the Chichibu railway, a system traversing a district rich in the natural wealth of mines and quarries and noted for its production of raw silk.

For many years this railway was operated under steam power, but increasing freight movement and the ever-present fuel problem made it imperative to seek a solution of the power difficulties. Moreover, the development of electric plants in this district had been rapid and an ample supply of current was ensured. After a careful consideration, therefore, of all the operating factors, a decision was made calling for the electrification of the line from Kagemore to Kumagaya, a distance of 35 miles of main line.

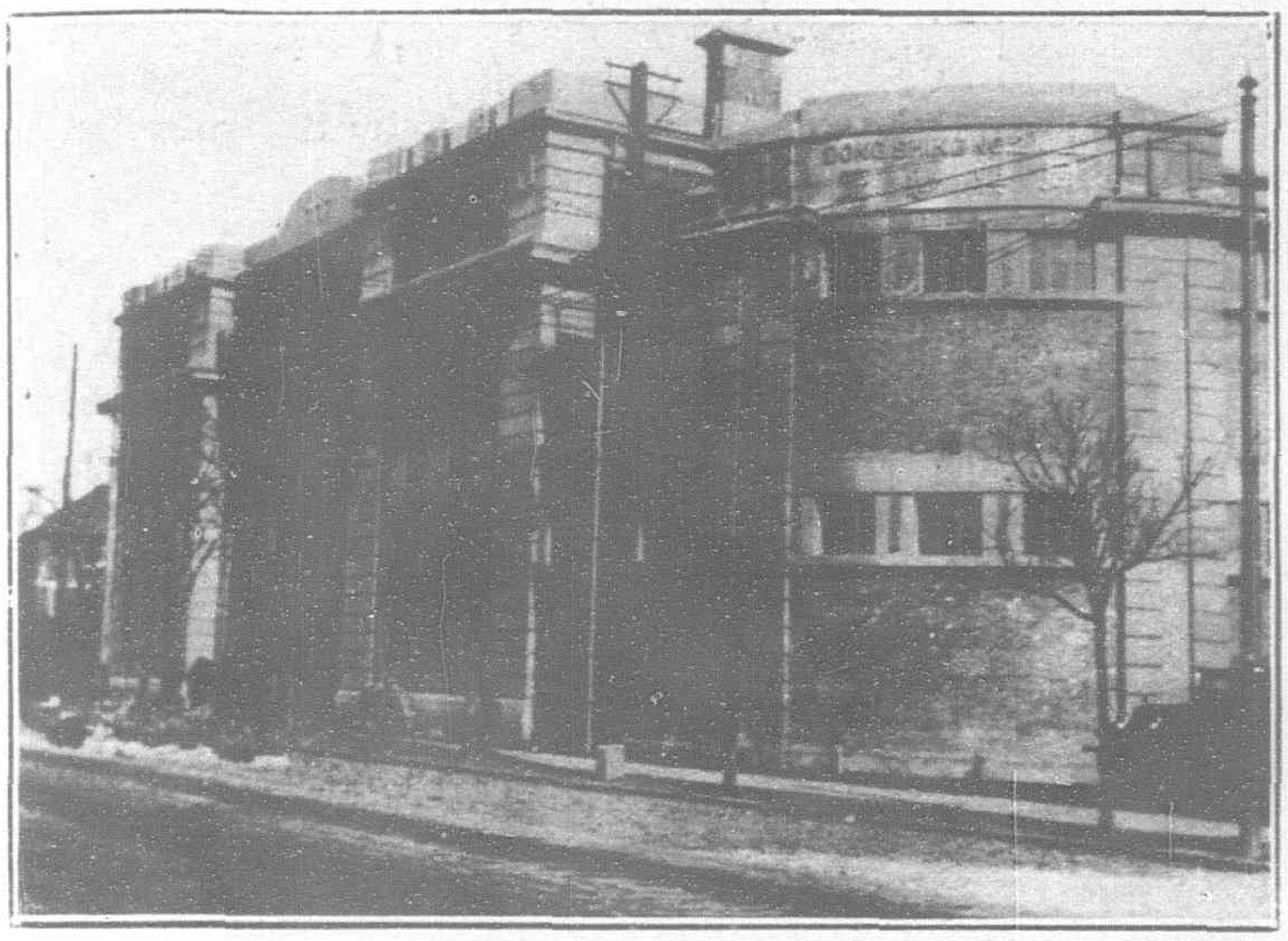
Power is supplied by the Musashino Electric Power Company, transformed through two substations to 1,200 volts direct current.

Three multiple unit cars, equipped by the Westinghouse Company, will be operated in passenger and express service. Five Baldwin-Westinghouse electric locomotives were shipped in October 1922, to handle mixed freight and passenger trains, which as a rule consist of four passenger cars and fourteen goods cars, making a total of approximately 204 gross tons. The electric locomotives are of the 0-4-0+0-4-0 non-articulated type, built for 3-ft. 6-in. gauge track with 38-in. wheels. They weigh approximately 82,150-lb.

A New Shanghai Cotton Mill

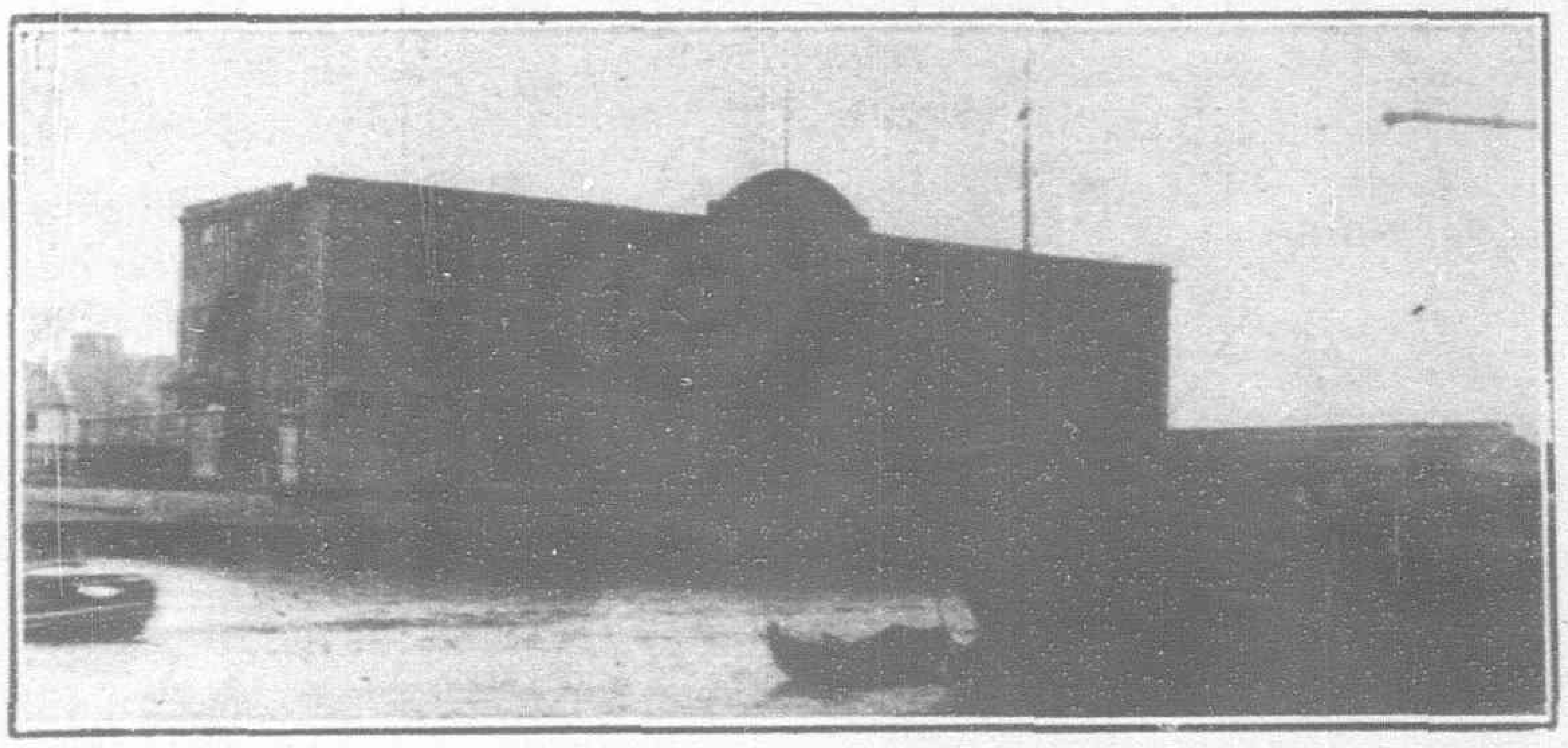
The Dong Shing No. 2 Mill

NUMBER two mill of the Dong Shing Spinning and Cotton Weaving Company was completed in March and will commence operation in April, 1924 with 28,000 spindles and 952 looms. It occupies an area of 58 mow with its office fronting at number 96 Yangtszepoo Road and the property running back to the godown which looks out upon the jetty and the Whangpoo River. The plant consists of a three-story office, three spinning mills of two stories each, a one-story weave-shed with saw-tooth roof, 16 two story personnel houses for Japanese members of the staff, and a godown of three stories. The plant is of reinforced concrete with the exception of the weave-shed, which is of brick. The architect is Mr. S. Okana and the constructors Sing king-kee. No addition on account of the construction new mill has been made to the capital of the company. The nominal capital is Y. 15,000,000, of which Y. 6,000,000 is paid up. With the commencement of operations, however, a call will be made on the shareholders for another payment of Y. 2,500,000.



Office of the Dong Shing No. 2 Mill on Yangtszepoo Road, Shanghai

Passage between Middle and South Mill



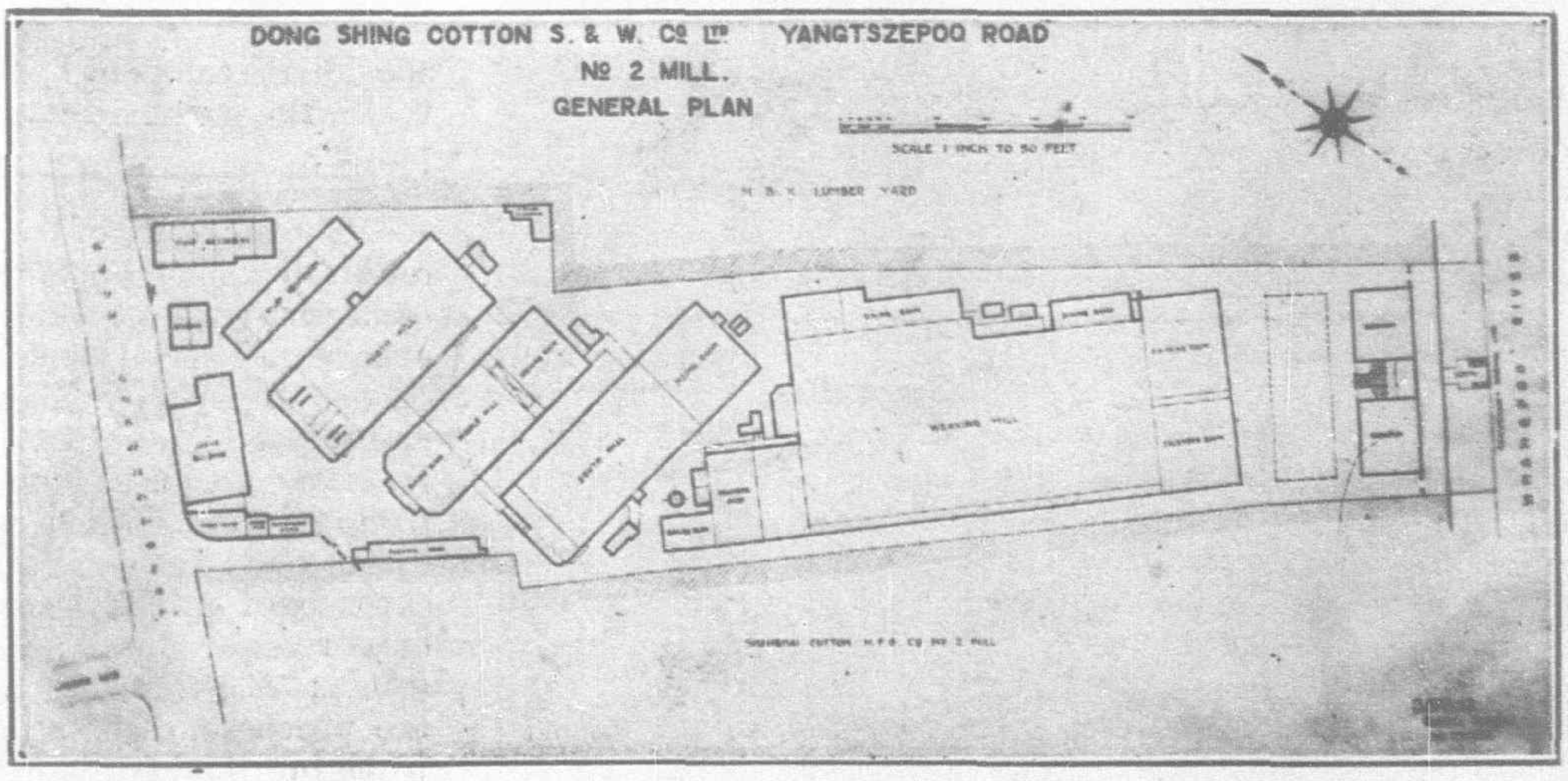
Three Storey Godown of the Dong Shing No. 2 Mill

It is expected that when the plant is running to capacity it will employ 3,000 hands, and will take from the municipal electricity department 1,800 kilowatts of power. The plant is at present complete except for the installation of the transformer, and wiring, and for the connecting up of the machinery. The largest part of the machinery is Japanese, made by Toyoda, following British patterns, and the remainder is British, supplied by Platt Brothers. Construction was commenced in December, 1922.

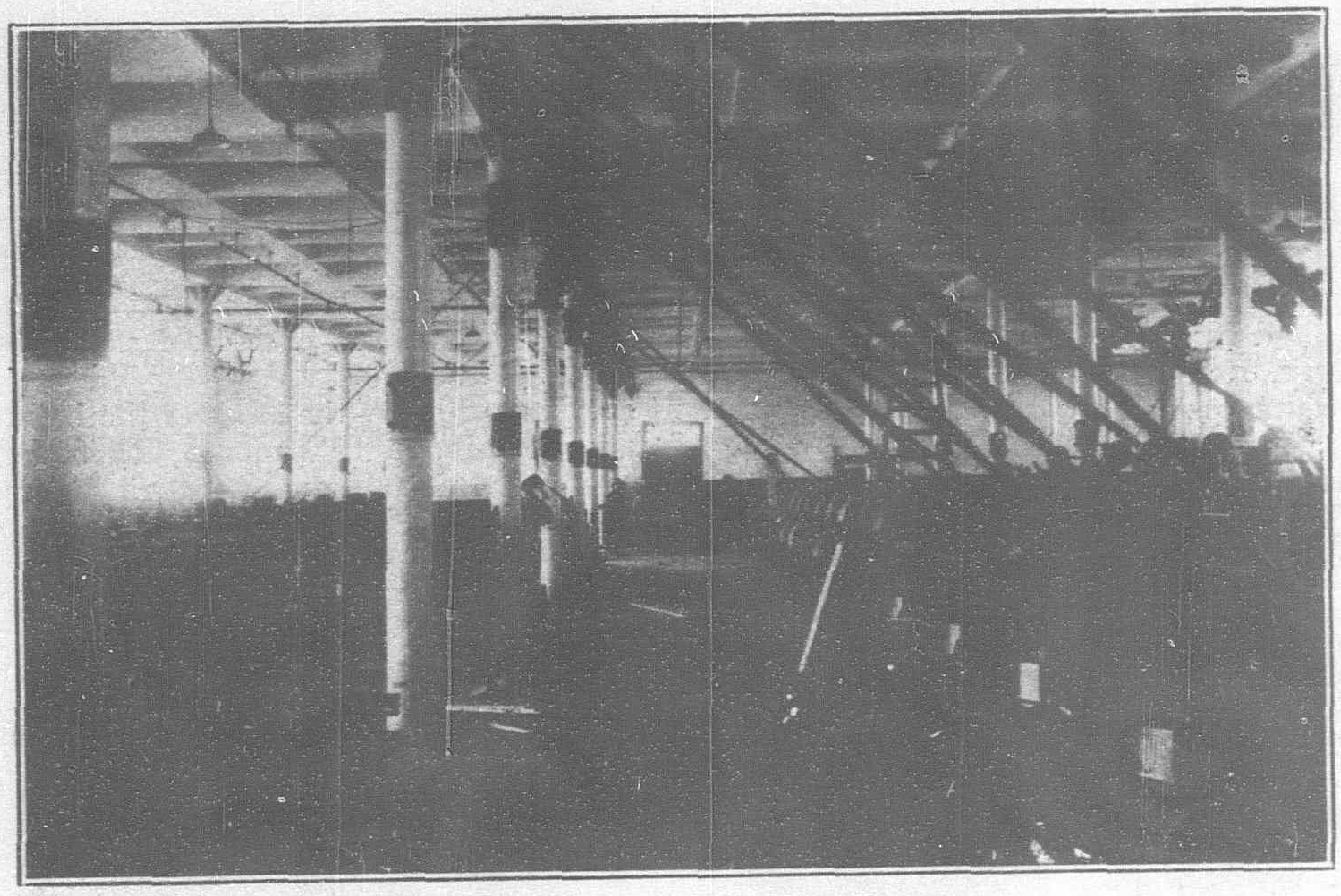
The size of the plant may be gauge by the areas of the buildings, which are as follows; spinning mills (counting all floors) 74,088 square feet; weave shed, 109,000 square feet, including a dining room of 5,000 square feet for the personnel a carpenter shop and machine shop with a combined area of 8,800 square feet, and a boiler room occupying 1,920 square feet. The total area of the three floors of the godown is 12,240 square feet, and space has been left for the possible erection in the future of another godown of the same size.

The cotton will go through three bale breakers and two Creighton openers equipped with willows and lattice feeders; from the opening room it will be conveyed through hopper feeders to two roving openers which will in turn move it on to six interscutchers and six finisher scutchers. This machinery is entirely supplied by Toyoda, as are the 129 carding engines to which the cotton now passes.

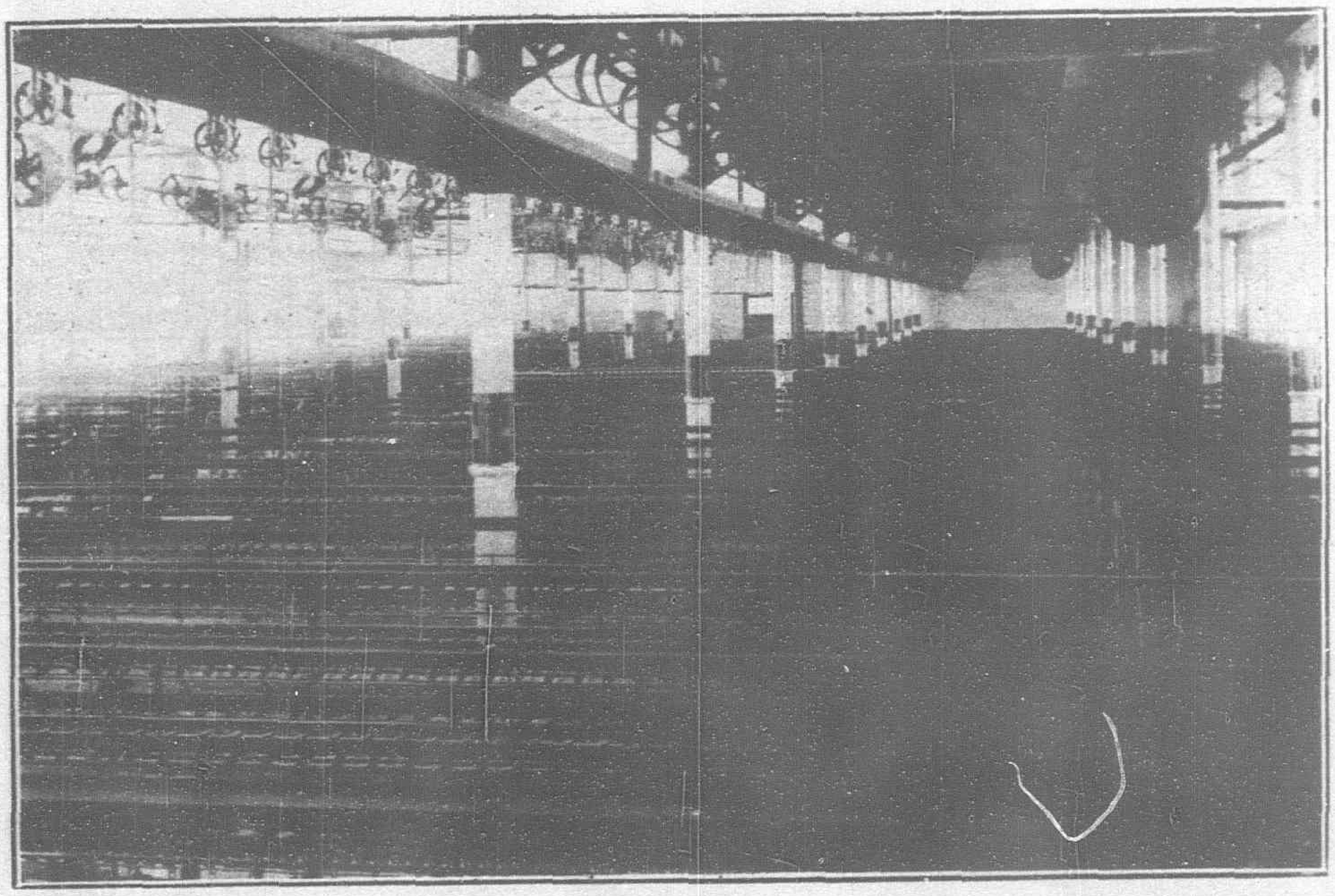
From the carding machines the cotton slivers pass over drawing frames of which 21 are Toyoda and 6 Platt Brothers; thence to slubbing frames of which 14 are Japanese and 4 British. From here it goes to intermediate frames, of which 15 are Japanese and 6 British; to roving frames of which 27 are Japanese and 16 British, and then on to the ring frames in the spinning room.



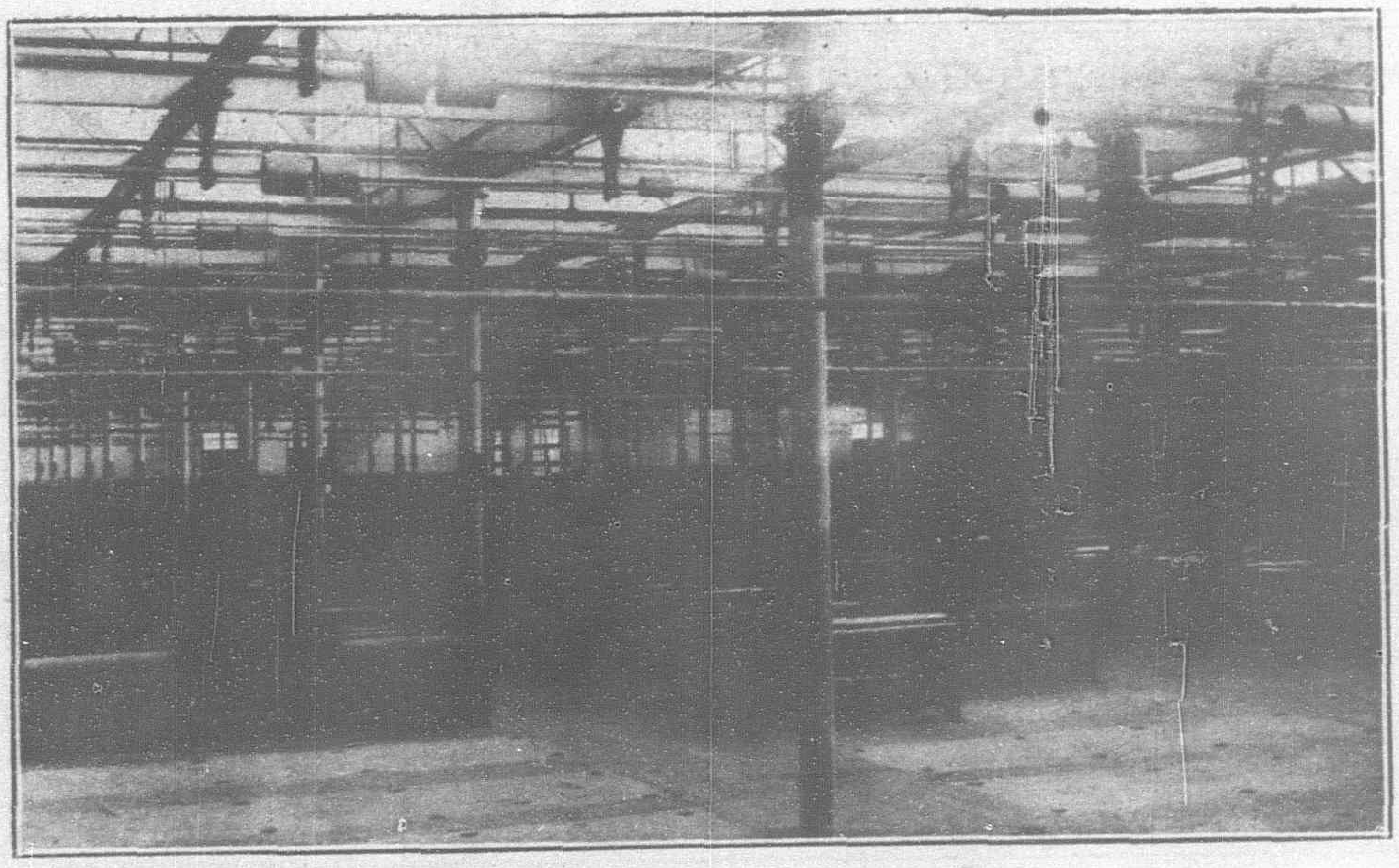
General Plan of Dong Shing Cotton Spinning and Weaving Company



Carding Machines and Drawing Frames



Weaving Shed



"Toyoda" Ring Frames in the Spinning Room

Of the warp ring frames 22 are Japanese made and 20 British made, each frame containing 384 spindles. The weft ring frames, each containing 424 spindles, are all Japanese.

Power is supplied to the spinning frames by two motors in each room connected with an overhead shaft, which in turn drives the frames. The belting was supplied by the Belting and Leather Products' Company, an American firm. All of the looms are Japanese.

The machine-room contains three engine-lathes, eight, six, and 12-ft. long; a 16-in. gear hopper machine; a 16-in. back-geared crank shaper; a 20-in. upright drill; a bench drill; gas welding apparatus, and other small machines. The boiler room contains two Lancashire boilers seven by thirty feet for the production of heat only.

A transformer station on the premises will step down the municipal electricity department current from 6,000 volts to 2,000 volts for motors of 50 horse-power and over, to 350 volts for motors below 50 horse-power, and to 100 volts for lighting purposes.

When the new plant commences operation, the company will move its head offices from their present location at 181 Gordon Road to the new plant at Yangtszepoo. This step is taken not only on account of the importance of the new plant, but with a view to construction of a possible future plant on the opposite side of the river at Pootung.

Mitsui Interests Form Trust Company

The formation of the Mitsui Shintaku Kabushiki Kaisha or Mitsui Trust Co. (Ltd.), to commence operations in March, is a proposed new activity of the Mitsui interests, according to a report, in the Tokyo *Asahi*, which has been confirmed verbally by Mr. Oshima, director of Mitsui Gomei Kaisha.

The capital is reported as 30,000,000 yen (1 yen=$0.4538 at current exchange), in 30,000 shares of 100 yen each. One-half of the stock is to be subscribed by the Mitsui Gomei Kaisha or holding company of the combined Mitsui interests. The other half will be taken by subsidiary companies and individuals connected therewith, no shares being offered the general public.

The functions of the new company will be the ordinary fiduciary acts provided by the trust law of Japan, such as holding in trust for individuals or corporations (1) money, (2) securities, (3) claims or debts, (4) movable property, (5) real estate, and (6) land leases, etc. Further supplementary functions are as follows: Safe-deposit service; guaranty of credits; acting as agent in real estate or leases or in financing operations; insurance of public loans, corporate debentures, or corporate stocks; the disbursement of dividends; the handling of fiscal matters; and the purchase, disposal, or management of properties or liquidation of businesses.

Interior of One of Camphor Refineries of the Japanese Monopoly Bureau in Formosa.

China and Japan's Camphor Monopoly Threatened

A New Synthetic Camphor Process

TO quote the *Journal of Commerce*, " One of the greatest discoveries ever made in the field of organic chemistry took place last year, says the *N. Y. Journal of Commerce*, when Prof. R. J. Moore, formerly instructor at Columbia University, announced that he had found a process for converting turpentine into synthetic camphor."

It is this process, perfected by Professor Moore, who is one of the officials of the chemical refining syndicate, which is the basis of a new industry started in Brooklyn by the chemical refining syndicate. Tentative orders have already come in on the basis of the samples shown by the large force of salesmen.

The first steel unit of the proposed plant in this borough is now being erected at the Frasier Tablet Company at Nos. 453-473 Nineteenth street. The process employed is now secret, but will shortly be patented.

There are extremely few people who realize the vast importance of camphor in our every-day life. There are probably even still fewer who know that for years Japan has absolutely controlled the camphor output of the world. From time immemorial it was controlled by China and Japan. Then Japan secured the Island of Formosa from China and her monopoly became complete, because Formosa is the leading single spot where the camphor tree grows.

Camphor is obtained from the wood and leaves of the camphor laurel, a tree which requires thrty years to reach its maturity and then must be cut down before camphor can be extracted. When chopped down it is broken up into chips and the camphor and related oils distilled off. This product is crude and must be repeatedly refined before it is ready for use.

About 15 to 20 per cent. of all the camphor output is used for drugs and medicines. And about 80 per cent. of all the camphor finds its use in some branch of the celluloid industry. Camphor is the basic chemical in the manufacture of plastics, such as celluloid, photographic and motion picture films, artificial or French ivory, such as pyralin, etc., horn ; it is used in the manufacture of patenl leather and explosives. Besides films and artificial ivory there are hundreds of such items as piano keys, art amber, art tortoiseshell, pipe stems, billiard balls, knife handles, toys, toilet articles, in all of which camphor is one of the most important ingredients.

For years the American celluloid industry has not been able to get its camphor requirements. Years ago Japan did not use any of the camphor for herself. She used little in her own drugs and she had no celluloid industry. But since the war began she has been rapidly developing a celluloid industry. She has built and is building some of the largest plants for the production of the celluloid type of products in the world. Should there have been no substitute for her camphor developed, it is pointed out that Japan could at a moment's notice cut off the outside world's camphor supply and force every country in the world to buy all of its celluloid products from her.

When the American industries, devoted to the manufacture of products to which camphor is an absolute essential, observed Japan's actions in developing her own use of camphor, forebodings arose. Frantic efforts were made to grow camphor trees in the United States by the United States department of agriculture, the Du Ponts, the Celluloid Company, the Eastmans, but the efforts were unsuccessful. The outlook was not particularly bright.

Then Professor Moore announced his development of a process for making synthetic camphor, but it was such a lengthy and so costly a process that it was not considered commercially practicable. But Professor Moore went back to work.

The result was Professor Moore's complete success, the development of a process which could produce camphor at a minimum cost, easily practicable from a commercial standpoint, and capable of making camphor from the raw products, of which turpentine is the chief, to the finished camphor, in eight hours, accomplishing in that length of time what requires thirty years in Japan.

Synthetic camphor means camphor manufactured in a factory instead of obtained from camphor trees. It analyzes the same as camphor and is declared to be just as good if not better than the natural product for all its uses, especially in making the celluloid type of products, due to the fact that it is free from the natural oils which must otherwise be refined out of the camphor, and it is uniform, which the natural product is not.

For the purpose of putting Professor Moore's synthetic camphor on the market in commercial quantities the chemical refining syndicate has been formed with a plant in Brooklyn, where the camphor is made from turpentine, which the United States has in abundance.

The engineers' report shows that camphor can be made for less than forty cents a pound. The company's first unit is announced to produce two tons per day, or 1,339,000 pounds per year.

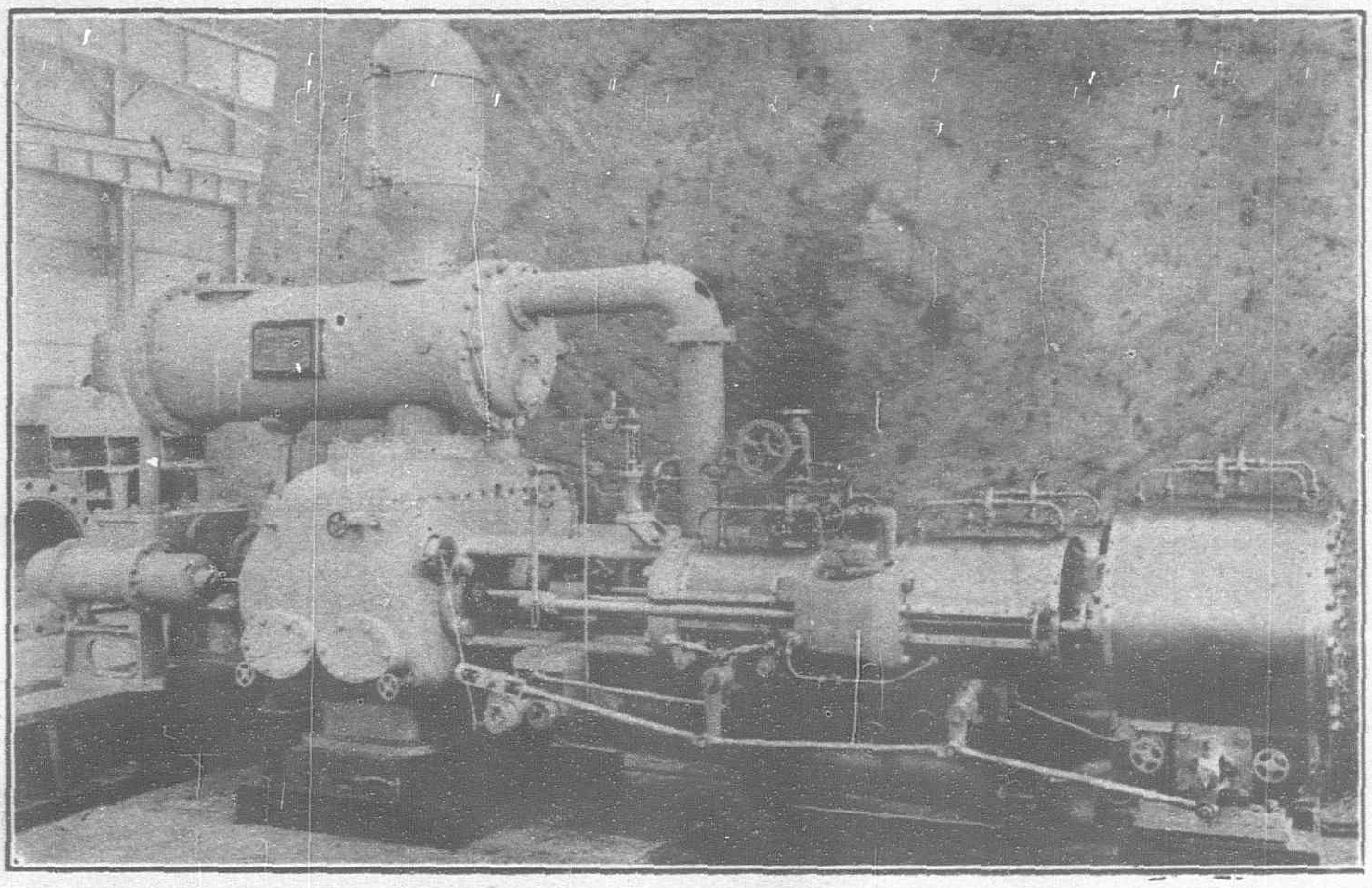
Worthington Triple-Expansion Pumping Engines in China

THE plant of the Shanghai Inland Waterworks was recently augmented by the addition of a Worthington Triple Expansion pumping engine as shown in the accompanying illustration from a photograph taken in the works before shipment to China. This type of engine is a special favorite for waterworks service because of its low first cost, regular construction, simplicity, freedom from breakdown and a low fuel consumption. Similar pumping engines are at work at the Nantao and Canton waterworks in addition to a large number in India and other parts of Eastern Asia.

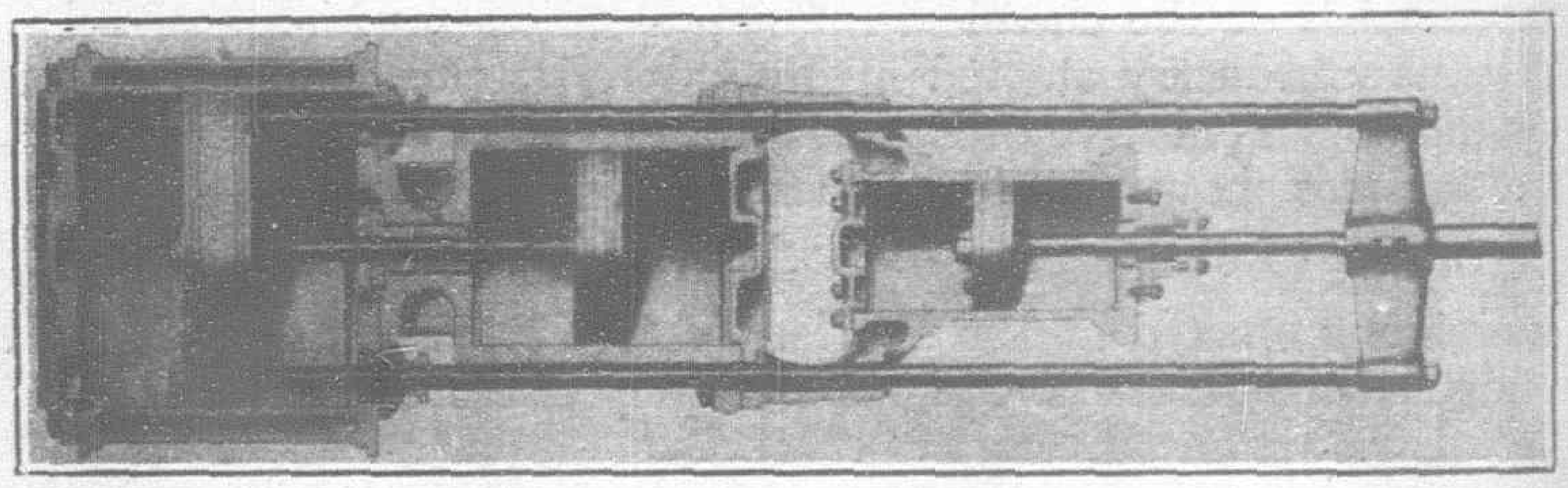
The great advantage of the engine is that it has no flywheel or bearings that are liable to wear and an ingenious arrangement of piston rods are shown on the accompanying illustration. Another advantage is that the engine being duplex double acting, there are four water pulses each revolution and one of these small effect pulses is still further minimised by the plungers being synchronised in such a way that just as one plunger is slowing down for the end of the stroke, the other plunger is just getting up the speed so that the total result is a practically even flow of water from the pump, making this type of pump particularly adapted for pumping into long pipe lines without fear of water hammer bursting the pipes.

The last engine of this design supplied to the Shanghai Inland City Waterworks was the largest capacity waterworks pumping engine in China and was capable of delivering 12 million gallons of water per 24 hours against a total head of 130-ft. when supplied with steam at 100-lb. pressure.

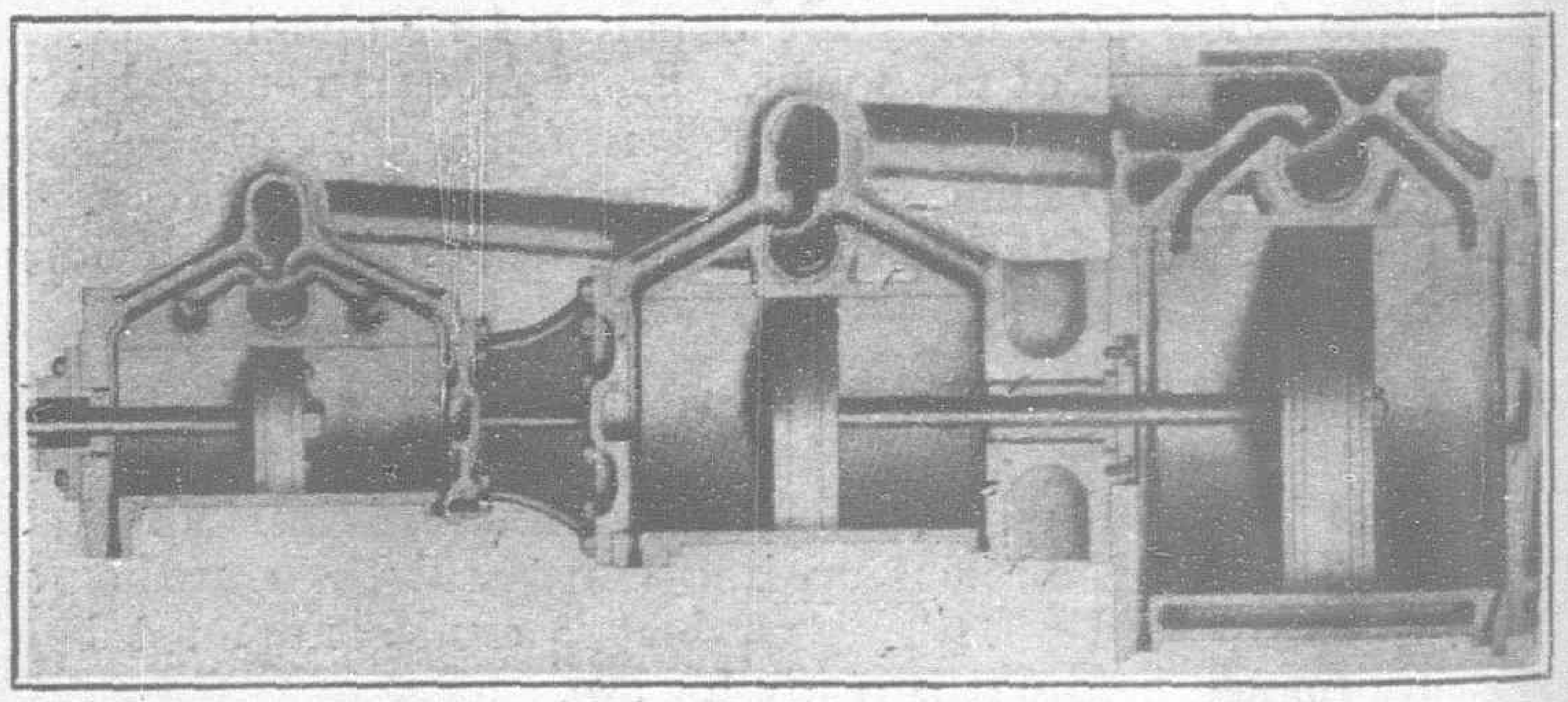
This engine was of the triple-expansion type with 2—15-in. diameter high-pressure cylinders, 2—23-in. diameter intermediate cylinders, 2—38-in. low-pressure cylinders, 28-in. diameter water cylinder, all with a common stroke of 24-in. Pump end was of the plunger and ring type and was fitted with a surface condenser on the delivery of the pump and attached air pump.



Worthington Triple-Expansion Pumping Engine Installed at the Shanghai Inland Waterworks. Capacity 12,000,000 gallons per 24 hours, against a head of 130 feet



Arrangement of Rods



Sectional View of Steam End

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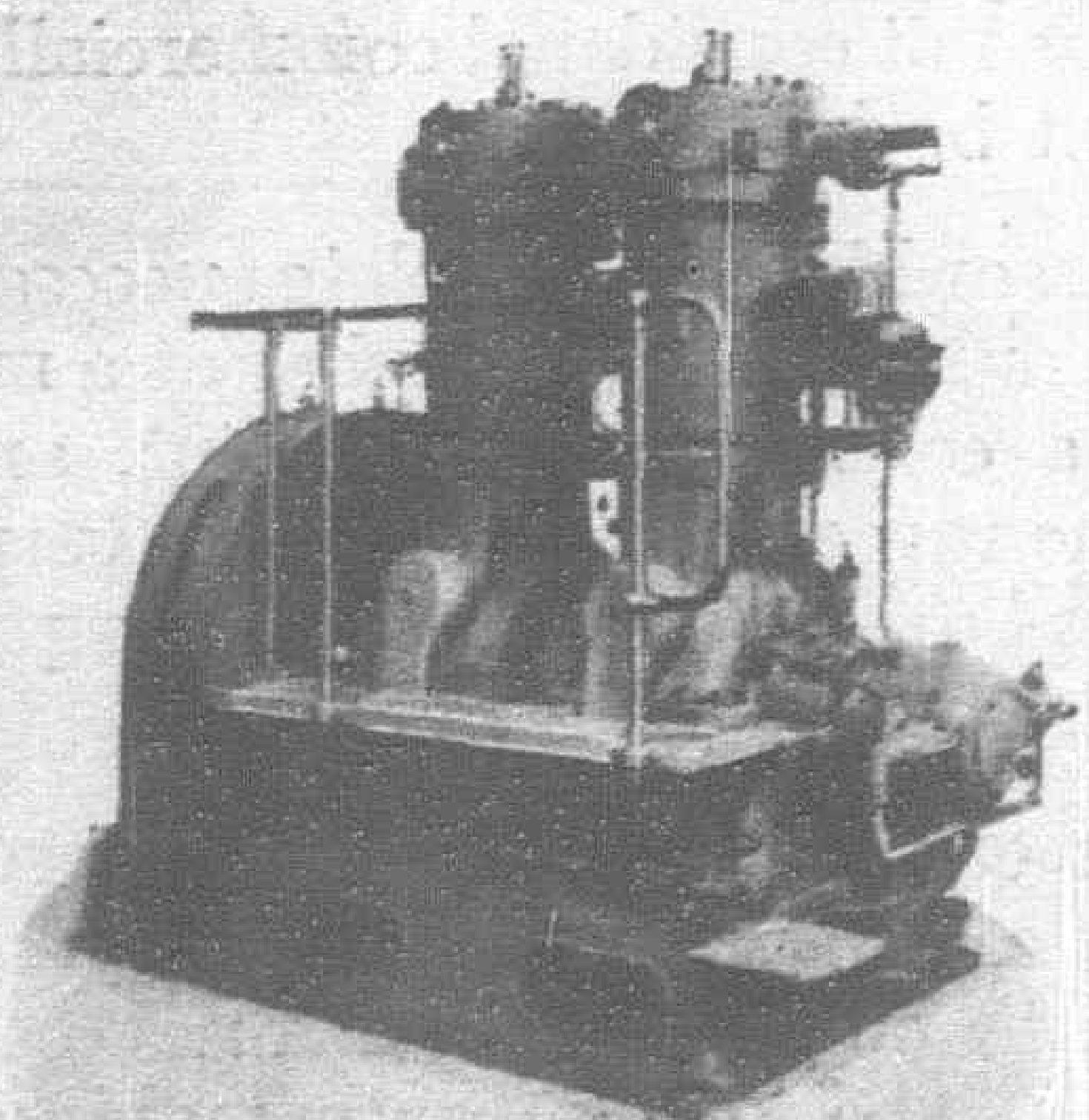

Hankow Will Have Tramway

Prominent merchants in Hankow are talking about promoting a tramway company with a preliminary capital of $2,000,000, to operate tram service starting from the bridge, back of the Peking-Hankow railway to Liu Kia-miao, near the Han River, a distance of 50 *li*. Rail-less trams will also be introduced. A plan has been drawn up and submitted for approval at the civil governor's Yamên, Wuchang.